

Document Number DG6110-MAN/E

ORBISPHERE Model 6110 Total Package Analyzer

USER MANUAL

September 2009, Revision A



LANGE 

UNITED FOR WATER QUALITY

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Section 1 General Information

1.1 About this manual

The information in this manual has been carefully checked and is believed to be accurate. However, Hach Lange assumes no responsibility for any inaccuracies that may be contained in this manual. In no event will Hach Lange be liable for direct, indirect, special, incidental, or consequential damages resulting from any defect or omission in this manual, even if advised of the possibility of such damages. In the interest of continued product development, Hach Lange reserves the right to make improvements in this manual and the products it describes at any time, without notice or obligation.

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1.2 Safety information

Please read the entire manual before unpacking, setting up, or operating this instrument.

Pay particular attention to all warning and caution statements. Failure to do so could result in serious injury to the operator or damage to the equipment.

To ensure the protection provided by this equipment is not impaired, do not use or install this equipment in any manner other than that which is specified in this manual.

1.2.1 Use of hazard information

WARNING

A warning is used to indicate a condition which, if not met, could cause serious personal injury and/or death. Do not move beyond a warning until all conditions have been met

CAUTION

A caution is used to indicate a condition which, if not met, could cause minor or moderate personal injury and/or damage to the equipment. Do not move beyond a caution until all conditions have been met.



Note: A note is used to indicate important information or instructions that should be considered before operating the equipment.

1.2.2 Service and repairs

None of the instrument's components can be serviced by the user. Only personnel from Hach Lange or its approved representative(s) is (are) authorized to attempt repairs to the system and only components formally approved by the manufacturer should be used. Any attempt at repairing the instrument in contravention of these principles could cause damage to the instrument and corporal injury to the person carrying out the repair. It renders the warranty null and void and could compromise the correct working of the instrument and the electrical integrity or the CE compliance of the instrument.











If you have any problems with installation, starting, or using the instrument please contact the company that sold it to you. If this is not possible, or if the results of this approach are not satisfactory, please contact the manufacturer's Customer Service.

1.2.3 Instrument switches and buttons

	The mains power switch is located at the rear left of the instrument (No. 2 in Figure 3 on page 15). To switch the instrument on and off, press the rocker switch to the required position: "O" for Off and "I" for On .
	The measurement button is located at the front right of the instrument (No. 5 in Figure 2 on page 14). Press this button to start a package measurement.

1.2.4 Precautionary labels

Read all labels and tags attached to the instrument. Personal injury or damage to the instrument could occur if not observed.

	This symbol, when noted on a product, indicates a potential hazard which could cause serious personal injury and/or death. The user should reference this instruction manual for operation and/or safety information.
	This symbol, when noted on a product enclosure or barrier, indicates that a risk of electrical shock and/or electrocution exists and indicates that only individuals qualified to work with hazardous voltages should open the enclosure or remove the barrier.
	This symbol, when noted on the product, indicates that the marked item can be hot and should not be touched without care.
	This symbol, when noted on the product, indicates the presence of devices sensitive to electrostatic discharge and indicates that care must be taken to prevent damage to them.
	This symbol, when noted on the product, identifies a risk of chemical harm and indicates that only individuals qualified and trained to work with chemicals should handle chemicals or perform maintenance on chemical delivery systems associated with the equipment.
	This symbol, when noted on the product, indicates a laser device is used in the equipment.
	This symbol, if noted on the product, indicates the need for protective eye wear.
	This symbol, when noted on the product, identifies the location of the connection for protective earth (ground).
	Electrical equipment marked with this symbol may not be disposed of in European public disposal systems. In conformity with European local and national regulations, European electrical equipment users must now return old or end-of-life equipment to the manufacturer for disposal at no charge to the user.
	Products marked with this symbol indicates that the product contains toxic or hazardous substances or elements. The number inside the symbol indicates the environmental protection use period in years.

1.2.5 Class 1 LASER

A Class 1 LASER is installed in this instrument. Class 1 LASERS are products where the radiant power of the LASER beam accessible (the accessible emission) is always below the Maximum Permissible Exposure value. Therefore, for Class 1 LASERS the output power is below the level at which it is believed eye damage will occur. Exposure to the beam of a Class 1 LASER will not result in eye injury. Class 1 LASERS may therefore be considered safe. However, Class 1 LASER products may contain LASER systems of a higher Class but there are adequate engineering control measures to ensure that access to the beam is not reasonably likely.

This Class 1 Laser product complies with 21 CFR Chapter 1, subchapter J. It is evaluated and tested in accordance with EN 61010-1, Safety Requirements for Electrical Equipment for Measurement and Control and Laboratory Use and IEC/EN 60825-1, Safety of Laser Products.


1.2.6 CFL backlight

The CFL (compact florescent light) used for backlighting the screen display contains a small amount of mercury. Please dispose of any used CFL's in accordance with local, state or federal laws concerning the disposal of products containing mercury.

1.2.7 Use of antifoam

Antifoam is injected into the sample as part of the measurement process. Once a sample has completed the measurement process it will therefore contain a small amount of antifoam. After measurement, ensure the sample is disposed of in a sink (or similar) to avoid any risk of ingestion. Refer also to the material safety datasheet (MSDS) [Silicon antifoam \(part number 33156\) on page 93](#) for additional antifoam safety information.

1.3 Product recycling information

	<p>ENGLISH</p> <p>Electrical equipment marked with this symbol may not be disposed of in European public disposal systems after 12 August 2005. In conformity with European local and national regulations (EU Directive 2002/96/EC), European electrical equipment users must now return old or end-of-life equipment to the manufacturer for disposal at no charge to the user.</p> <p>Note: For return for recycling, please contact the equipment manufacturer or supplier for instructions on how to return end-of-life equipment for proper disposal.</p>
	<p>DEUTSCH</p> <p>Elektrogeräte, die mit diesem Symbol gekennzeichnet sind, dürfen in Europa nach dem 12. August 2005 nicht mehr über die öffentliche Abfallentsorgung entsorgt werden. In Übereinstimmung mit lokalen und nationalen europäischen Bestimmungen (EU-Richtlinie 2002/96/EC), müssen Benutzer von Elektrogeräten in Europa ab diesem Zeitpunkt alte bzw. zu verschrottende Geräte zur Entsorgung kostenfrei an den Hersteller zurückgeben.</p> <p>Hinweis: Bitte wenden Sie sich an den Hersteller bzw. an den Händler, von dem Sie das Gerät bezogen haben, um Informationen zur Rückgabe des Altgeräts zur ordnungsgemäßen Entsorgung zu erhalten.</p>
	<p>FRANCAIS</p> <p>A partir du 12 août 2005, il est interdit de mettre au rebut le matériel électrique marqué de ce symbole par les voies habituelles de déchetterie publique. Conformément à la réglementation européenne (directive UE 2002/96/EC), les utilisateurs de matériel électrique en Europe doivent désormais retourner le matériel usé ou périmé au fabricant pour élimination, sans frais pour l'utilisateur.</p> <p>Remarque: Veuillez vous adresser au fabricant ou au fournisseur du matériel pour les instructions de retour du matériel usé ou périmé aux fins d'élimination conforme.</p>
	<p>ITALIANO</p> <p>Le apparecchiature elettriche con apposto questo simbolo non possono essere smaltite nelle discariche pubbliche europee successivamente al 12 agosto 2005. In conformità alle normative europee locali e nazionali (Direttiva UE 2002/96/EC), gli utilizzatori europei di apparecchiature elettriche devono restituire al produttore le apparecchiature vecchie o a fine vita per lo smaltimento senza alcun costo a carico dell'utilizzatore.</p> <p>Nota: Per conoscere le modalità di restituzione delle apparecchiature a fine vita da riciclare, contattare il produttore o il fornitore dell'apparecchiatura per un corretto smaltimento.</p>
	<p>DANSK</p> <p>Elektriske apparater, der er mærket med dette symbol, må ikke bortskaffes i europæiske offentlige affaldssystemer efter den 12. august 2005. I henhold til europæiske lokale og nationale regler (EU-direktiv 2002/96/EF) skal europæiske brugere af elektriske apparater nu returnere gamle eller udtjente apparater til producenten med henblik på bortskaffelse uden omkostninger for brugeren.</p> <p>Bemærk: I forbindelse med returnering til genbrug skal du kontakte producenten eller leverandøren af apparatet for at få instruktioner om, hvordan udtjente apparater bortskaffes korrekt.</p>

SVENSKA

Elektronikutrustning som är märkt med denna symbol kanske inte kan lämnas in på europeiska offentliga sopsstationer efter 2005-08-12. Enligt europeiska lokala och nationella föreskrifter (EU-direktiv 2002/96/EC) måste användare av elektronikutrustning i Europa nu återlämna gammal eller uttrangerad utrustning till tillverkaren för kassering utan kostnad för användaren.

Obs! Om du ska återlämna utrustning för återvinning ska du kontakta tillverkaren av utrustningen eller återförsäljaren för att få anvisningar om hur du återlämnar kasserad utrustning för att den ska bortskaffas på rätt sätt.

ESPAÑOL

A partir del 12 de agosto de 2005, los equipos eléctricos que lleven este símbolo no deberán ser desechados en los puntos limpios europeos. De conformidad con las normativas europeas locales y nacionales (Directiva de la UE 2002/96/EC), a partir de esa fecha, los usuarios europeos de equipos eléctricos deberán devolver los equipos usados u obsoletos al fabricante de los mismos para su reciclado, sin coste alguno para el usuario.

Nota: *Sírvase ponerse en contacto con el fabricante o proveedor de los equipos para solicitar instrucciones sobre cómo devolver los equipos obsoletos para su correcto reciclado.*

NEDERLANDS

Elektrische apparatuur die is voorzien van dit symbool mag na 12 augustus 2005 niet meer worden afgevoerd naar Europese openbare afvalsystemen. Conform Europese lokale en nationale wetgeving (EU-richtlijn 2002/96/EC) dienen gebruikers van elektrische apparaten voortaan hun oude of afgedankte apparatuur kosteloos voor recycling of vernietiging naar de producent terug te brengen.

Nota: *Als u apparatuur voor recycling terugbrengt, moet u contact opnemen met de producent of leverancier voor instructies voor het terugbrengen van de afgedankte apparatuur voor een juiste verwerking.*

POLSKI

Sprzęt elektryczny oznaczony takim symbolem nie może być likwidowany w europejskich systemach utylizacji po dniu 12 sierpnia 2005. Zgodnie z europejskimi, lokalnymi i państwowymi przepisami prawa (Dyrektywa Unii Europejskiej 2002/96/EC), użytkownicy sprzętu elektrycznego w Europie muszą obecnie przekazywać Producentowi stary sprzęt lub sprzęt po okresie użytkowania do bezpłatnej utylizacji.

Uwaga: *Aby przekazać sprzęt do recyklingu, należy zwrócić się do producenta lub dostawcy sprzętu w celu uzyskania instrukcji dotyczących procedur przekazywania do utylizacji sprzętu po okresie użytkownia.*

PORTUGUES

Qualquer equipamento eléctrico que ostente este símbolo não poderá ser eliminado através dos sistemas públicos europeus de tratamento de resíduos sólidos a partir de 12 de Agosto de 2005. De acordo com as normas locais e europeias (Directiva Europeia 2002/96/EC), os utilizadores europeus de equipamentos eléctricos deverão agora devolver os seus equipamentos velhos ou em fim de vida ao produtor para o respectivo tratamento sem quaisquer custos para o utilizador.

Nota: *No que toca à devolução para reciclagem, por favor, contacte o produtor ou fornecedor do equipamento para instruções de devolução de equipamento em fim de vida para a sua correcta eliminação.*

1.4 Product disposal

Note: The following only applies to European customers.

Hach Lange is committed to ensuring that the risk of any environmental damage or pollution caused by any of its products is minimized as far as possible. The European Waste Electrical and Electronic Equipment (WEEE) Directive (2002/96/EC) that came into force on August 13 2005 aims to reduce the waste arising from electrical and electronic equipment; and improve the environmental performance of all those involved in the life cycle of electrical and electronic equipment.



In conformity with European local and national regulations (EU Directive 2002/96/EC stated above), electrical equipment marked with the above symbol may not be disposed of in European public disposal systems after 12 August 2005.

Hach Lange will offer to take back (**free of charge to the customer**) any old, unserviceable or redundant instruments and systems which carry the above symbol, and which were originally supplied by Hach Lange. Hach Lange will then be responsible for the disposal of this equipment.

In addition, Hach Lange will offer to take back (**at cost to the customer**) any old, unserviceable or redundant instruments and systems which do not carry the above symbol, but which were originally supplied by Hach Lange. Hach Lange will then be responsible for the disposal of this equipment.

Should you wish to arrange for the disposal of any piece of equipment originally supplied by Hach Lange, please contact your supplier or our After Sales Service department in Geneva for instructions on how to return this equipment for proper disposal.

1.5 Restriction of hazardous substances (RoHS)

The European Union RoHS Directive and subsequent regulations introduced in member states and other countries limits the use of six hazardous substances used in the manufacturing of electrical and electronic equipment.

Currently, monitoring and control instruments do not fall within the scope of the RoHS Directive, however Hach Lange has taken the decision to adopt the recommendations in the Directive as the target for all future product design and component purchasing.



This product is compliant with the European Union RoHS Directive.

Note: The following only applies to exports of this product into the People’s Republic of China.



含有有毒或者危险物质及成分的产品。
环保使用期限标记（年）

有毒或者危险物质和成分						
部件名称	铅	汞	镉	六价铬	多溴联苯	多溴联苯醚
Backlit display		O				
Ultrasound head	O					
Brass spacers	O					
O: 表示所有此类部件的材料中所含有毒或危险物质低于限制要求 X: 表示至少有一种此类部件材料中所含有毒或危险物质高于限制要求						

Section 2 Specifications

2.1 Technical specifications

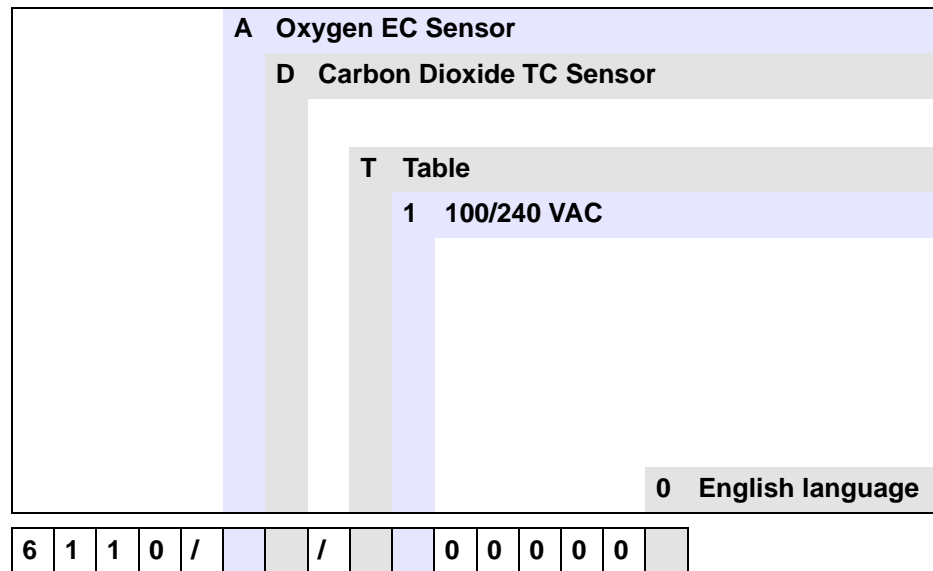
Specifications are subject to change without notice.

Analysis		
Measurement range	O ₂	1 ppb - 20 ppm
	CO ₂	0.75 - 5 V/V or 1.5 - 10 g/kg
Repeatability r ⁹⁵ (at 20°C ± 5°C)	Total Package Oxygen	± 5 µg/L ± 10% whichever is the greater
	CO ₂	± 0.05 V/V or 0.10 g/kg ± 2% whichever is the greater
	O ₂	± 2 ppb ± 10% whichever is the greater
Detection limits	O ₂	< 1 ppb
	CO ₂	0.01 V/V or 0.02 g/kg
Typical analysis time	About 4 minutes	
Sample throughput	12 samples per hour	
Antifoam cartridge refill	Approximately every 2,000 measurements	
Display units	O ₂ concentration	ppb or ppm
	CO ₂ concentration	V/V, g/kg, g/L or %W
	Pressure	bar, mbar, psia
	Temperature	°C, °F or K
	Package quantities	mg, mL, mg/L, mL/L or µg/L
Operating limits	Package temperature	-2 to 30°C (28 to 86°F)
	Package pressure	1.4 to 6.8 bar (20 to 73 psia)
	Ambient temperature	0 to 40°C (32 to 104°F)
	Relative humidity	Up to 80%
Package setup	Maximum package height	340 mm (13.39 ins)
	Minimum package height	90 mm (3.54 ins)
	Minimum volume	150 ml
	Enclosure types	Metallic or PET
Enclosure		
Dimensions (L x W x H)	537 x 540 x 942 mm (21.1 x 21.3 x 37.1 ins)	
Weight	55 kg (121 lbs)	
Enclosure protection	IP20	
Power requirements	100-240 VAC ±10% @ 50-60 Hz	
Power consumption	Max. 250 VA	
Purge gas	CO ₂ with purity > 99.9% at 4 to 7 bar (58 to 102 psia)	
Forcing gas	Air, N ₂ or CO ₂ at 2 to 7 bar (29 to 102 psia)	
Compliance		
European directives	Low voltage 2006/95/EC EMC 2004/108/EC	
Electromagnetic compatibility standards	EN 61326: 2006	
Safety standard	IEC/UL/CSA	61010-1
Laser product safety	IEC/UL/CSA	60825-1
Interface		
Digital display	TFT VGA (640 x 480) color display touch screen with backlight	
Operating system	Windows CE 4.2	
Languages	English	
Digital connections	1 x USB client, 2 x USB host, 1 x Ethernet, 1 x RS485	

2.2 Model identification system

The instrument identification number and the instrument serial number are located on the label on the back panel, and can be found on order confirmation and invoice papers.

The different models available are described in the following matrix:

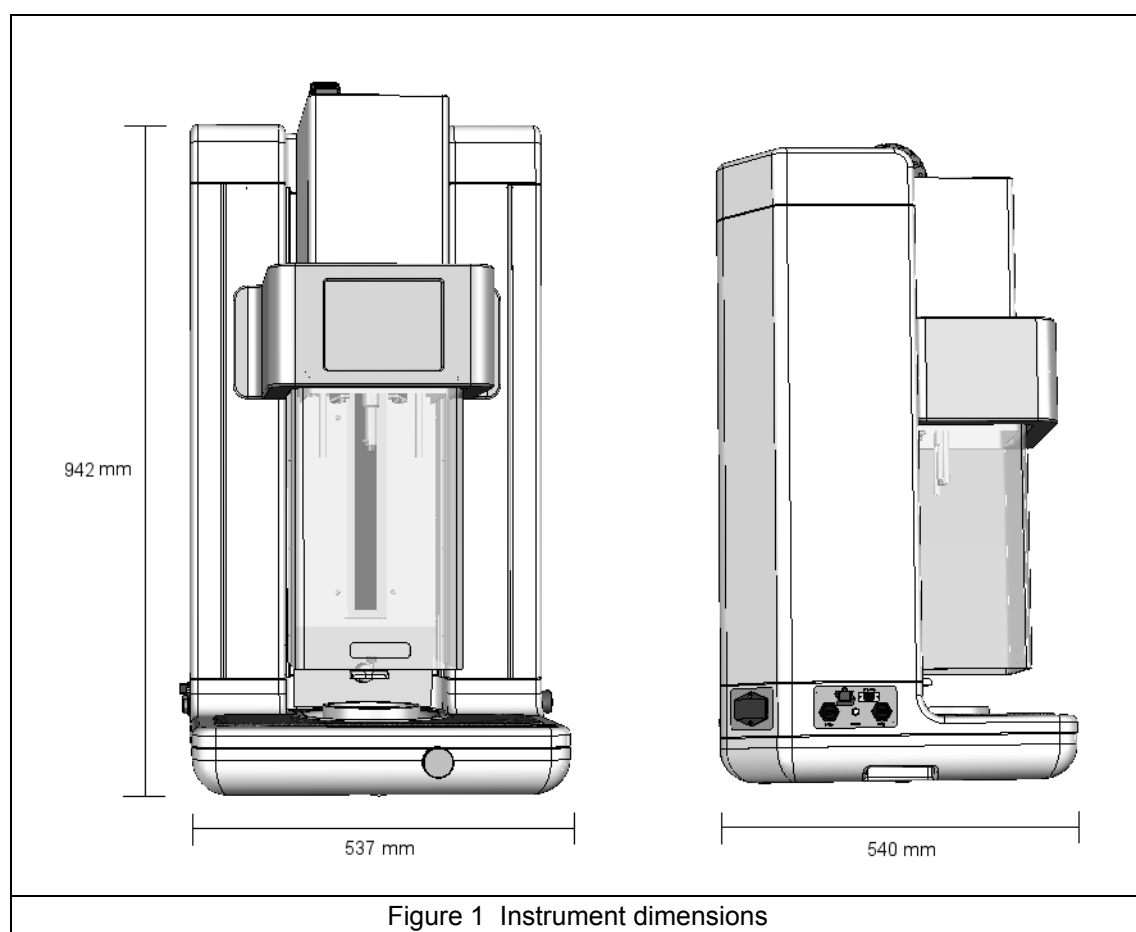


Example:

6110/AD/T1000000

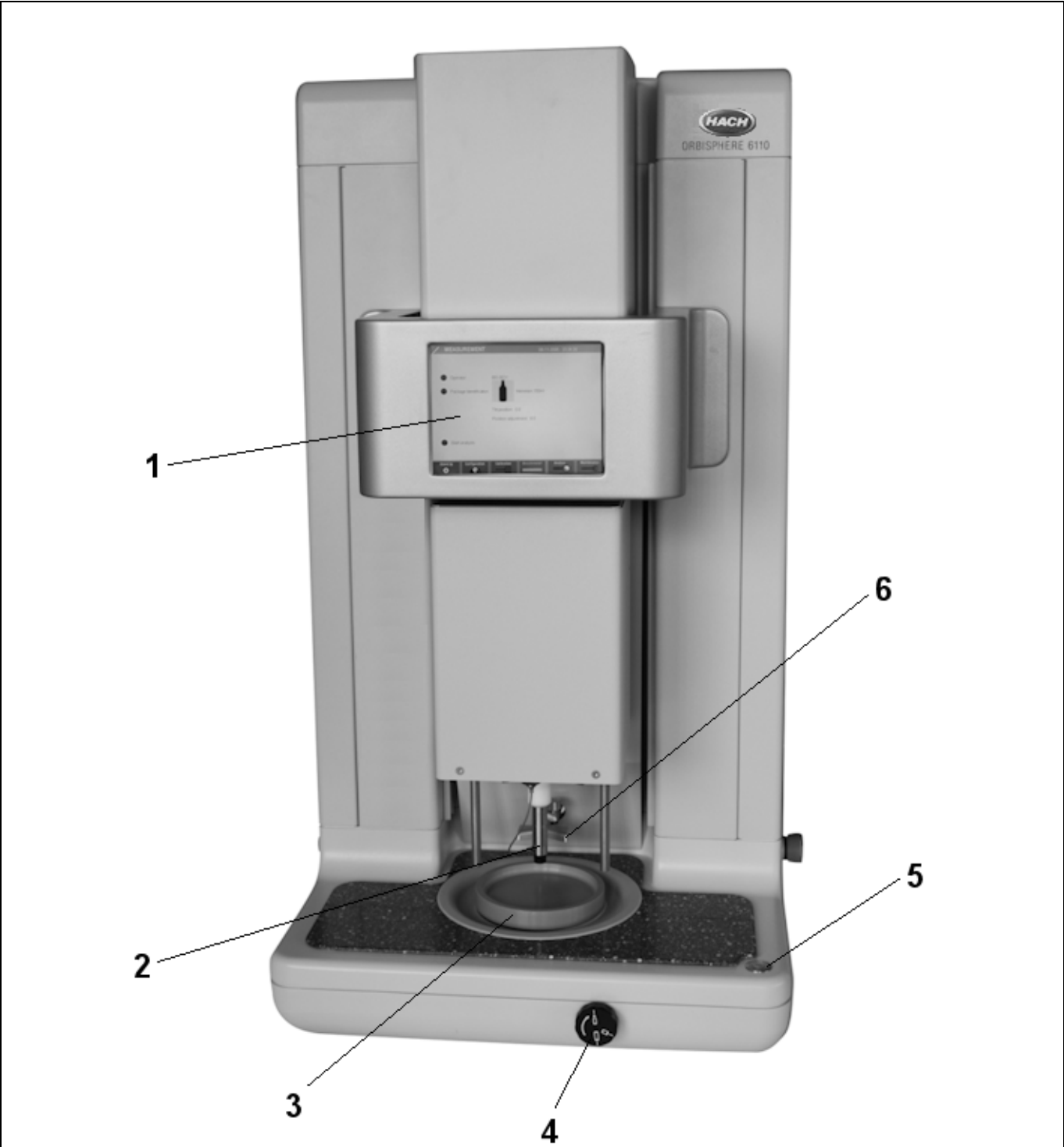
- Total Package Analyzer model 6110
- With an Oxygen EC sensor and a Carbon Dioxide TC sensor
- Table mounted version
- 100-240 VAC
- English language software

2.3 Instrument dimensions



2.4 Main instrument components

2.4.1 Front view



1. Display panel	4. Knob to tilt package
2. Package piercing device	5. Measurement start button with LED
3. Package holder	6. Package backstop

Figure 2 Instrument components - front view

2.4.2 Left side view



1. Power socket	5. USB-A connector for mass storage device
2. Power ON/OFF rocker switch	6. RS485 9-pin connector
3. USB-A connector for mass storage device	7. Ethernet connection
4. USB-B client 4-pin connector	

Figure 3 Instrument components - left side view

2.4.3 Right side view



2.5 Operation overview

1. Piercing

The reference volume is filled with the purge gas and the whole of the gas sampling path is fully purged. The purge stops when the rubber seal of the piercing device contacts the top of the package. Once the package is pierced, a pump injects an antifoam solution into the headspace.

2. Oxygen in headspace

The regulating valve is opened and the gas contained in the headspace flows on the O₂ sensor at a given rate. The quantity of O₂ in the headspace is obtained by integrating the volumes of O₂ leaving the package per unit of time.

3. Liquid analysis (CO₂ and O₂)

The gas flow is stopped and the ultrasonic sonotrode is activated. The equilibration pressure and the temperature are measured and a P/T CO₂ value is calculated. The regulating valve is then opened and the gas escaping the liquid mixes with the gas of the headspace. The O₂ signal is an exponential function to which coefficients can be included and the total O₂ contained in the bottle is calculated by integrating this function.

4. Headspace volume

At the end of the run, the gas flow is stopped and the valve is opened. The gas of the reference volume expands in the headspace and the pressure reaches a new value. The headspace volume is calculated with the ideal gas law principle.

5. End of measurement

The piercing head assembly is lifted out of the package. A short burst of gas purges the gas sampling path to flush out any residual liquid or foam. The system returns to the standby mode where the sensors are kept under a slight purge gas flow.

Section 3 Installation



WARNING

This section provides necessary information to install and connect the instrument. The installation of the instrument should be performed in accordance with relevant local regulations. Disconnect the power supply of the instrument before carrying out any work inside the instrument. Any work inside the instrument should be performed exclusively by personnel specialized and authorized to work on electrical installations. In addition, and in accordance with safety standards, it must be possible to disconnect the power supply of the instrument in its immediate vicinity.

CAUTION

Proper ESD (electrostatic discharge) protocols must be followed to prevent damage to the product when working with the electronic boards.

3.1 Unpacking

CAUTION

The instrument is heavy (55 kg) so extreme care must be taken with handling to avoid damaging the instrument or inflicting personal injury. It is highly recommended to have two people remove the instrument from the box. In addition, the instrument should always be moved and stored in a vertical position.

Carefully remove the instrument and its accessories from the box and packing material, referring to the packing list included to confirm that everything has been delivered. Please visually inspect the instrument for shipping damage. If anything is missing or damaged, contact the manufacturer or your dealer immediately.

You may want to retain the box and other packing material in case you later need to ship the instrument. Please dispose safely and ecologically of the box and packing material (if not stored for future use).

Please read through this manual thoroughly before carrying out the installation.

3.2 Main components

Your 6110 Total Package Analyzer is shipped with the following components:

Equipment included	
6110 instrument	
O ₂ EC sensor (pre-installed)	
Antifoam cartridge (empty)	
Antifoam recharge bottle 1L	
Syringe for anti foam cartridge	
Anti-foam priming vessel	
Kit of 4 pre-filled cartridges with premounted 2956A membranes for O ₂ sensors	
Filter with Gore-Tex membrane	
Piercing tip	
Seal to package	
Thermistor assembly w/o-ring	
Solenoid valve 2/2 NC w/o-ring	
Power supply cable	
6110 instrument user manual	
A1100 sensor user manual	

The following must be provided locally by the user:

Calibration and purge gas for O ₂ and CO ₂ sensor (CO ₂)	4 to 7 bar (58 to 102 psia), purity > 99.5%
Forcing gas for piercing device (air, CO ₂ or N ₂)	2 to 7 bar (29 to 102 psia), purity > 99.5%
Second calibration gas for CO ₂ sensor (optional)	4 to 7 bar (58 to 102 psia), purity ~ 70%

3.3 Positioning

CAUTION

The instrument is heavy (55 kg) so extreme care must be taken when handling, to avoid damaging the instrument or inflicting personal injury.

Hach Lange recommends installing the instrument on a sturdy laboratory table that can more than support the 55kg weight. Place it on a clean flat surface, and convenient to the power source. The display screen should be at head-height for easy viewing and operation.

3.4 Installation steps

Important Note: The instrument can be easily installed by following the installation wizard embedded in the instrument software. This wizard will start automatically once power is connected to the instrument for the first time. It is recommended to use this wizard for the first time installation. If further information or clarification is required, refer to the corresponding installation steps in this manual.

If not using the wizard, you will need to have access to the maintenance menu in order to complete the installation. Make sure you have read the section entitled [User Interface and Startup on page 29](#), so you are aware of startup and data entry procedures (including the default username and passwords), before starting the installation.

Also, ensure you have suitable standards available before performing any calibration. See [Standards requirements on page 53](#) for calibrating the instrument sensors.

1. Connect the instrument to a power source - see [Power supply on page 21](#).
2. Turn the instrument **ON**. An instrument auto-check routine will start automatically. As this is the first time the instrument will have been turned on, a number of red LEDs will appear but at this stage these should be ignored as the instrument is not yet fully operational.

Note: The following steps 3. to 7. can be completed by following the on-screen instructions and diagrams shown on the instrument by the installation wizard. Where processes are unclear from the wizard please refer to the corresponding step in these more detailed installation instructions.

3. Connect the purge and forcing gas to the instrument - see [Purge and forcing gas supply on page 21](#).
4. Prepare and install the antifoam cartridge - see [Antifoam cartridge preparation and installation on page 22](#).
5. Prepare and install the oxygen sensor - see [Oxygen sensor preparation and installation on page 25](#).
6. Prime the antifoam tubes - see [Prime the antifoam tubing on page 27](#).
7. Run an instrument auto-check - see [Run instrument auto-check on page 28](#).

Note: At this point, the physical installation has been completed.

8. Set the security levels, user ID's and passwords - see [Security and user management on page 43](#).

Note: To commission the instrument so that it is ready for use, follow the next steps to configure the instrument and calibrate the sensors.

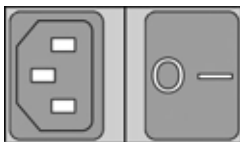
9. Configure the instrument parameters - see [Configuration on page 35](#).
10. Perform a barometric sensor calibration - see [Barometric pressure sensor on page 54](#).
11. Perform an oxygen sensor calibration - see [Oxygen sensor on page 59](#). Wait until the residual value of the sensor is low enough (controlled automatically by the analyzer). This operation may take around 2 hours depending on storage conditions

The instrument should now be ready for use. If a problem should arise, please refer initially to [Maintenance on page 71](#). If the problem cannot be overcome, please contact your Hach Lange representative who will be happy to assist you.

3.5 Power supply

CAUTION

Check voltage requirement sticker on the rear panel of the instrument before connecting.

	<p>Connect the power cable supplied with the instrument to the socket at the rear of the instrument (left in diagram) for AC power connection.</p> <p>To switch the instrument on and off, press the rocker switch (right in the diagram) - “I” for On and “O” for Off.</p>
-----------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

3.6 Purge and forcing gas supply

CAUTION

When the instrument is ON, purge gas must be supplied at all times to avoid damage to the sensors.

A single user supplied source of CO₂ can be used to supply the main forcing and purge gas by fitting a two-way divider (supplied) to the end of the gas supply tubing.

Install the gas connections as follows, referring to [Figure 4 on page 16](#) for the gas input and output connection placements:

1. Insert the forcing gas tubing into **Gas Input 1**. The recommended input pressure is 5 bar (maximum of 7 bar) of CO₂, N₂ or compressed air.
2. Insert the purge gas tubing into **Gas Input 2**. The recommended input pressure is 5 bar (maximum of 7 bar) of CO₂. This pressure should be higher than the package pressure, so for some beverages (e.g. soft drinks) it may be necessary to increase the input pressure.
3. Insert the calibration gas tubing into **Gas Input 3**. The recommended input pressure is 2 bar (maximum of 7 bar) of 95% pure CO₂.
4. If required, insert a reference pressure controller into **Gas Output** to control the output pressure level.

Note: *To make the instrument operational only the forcing gas and purge gas are mandatory. The calibration gas and reference pressure controller are optional.*

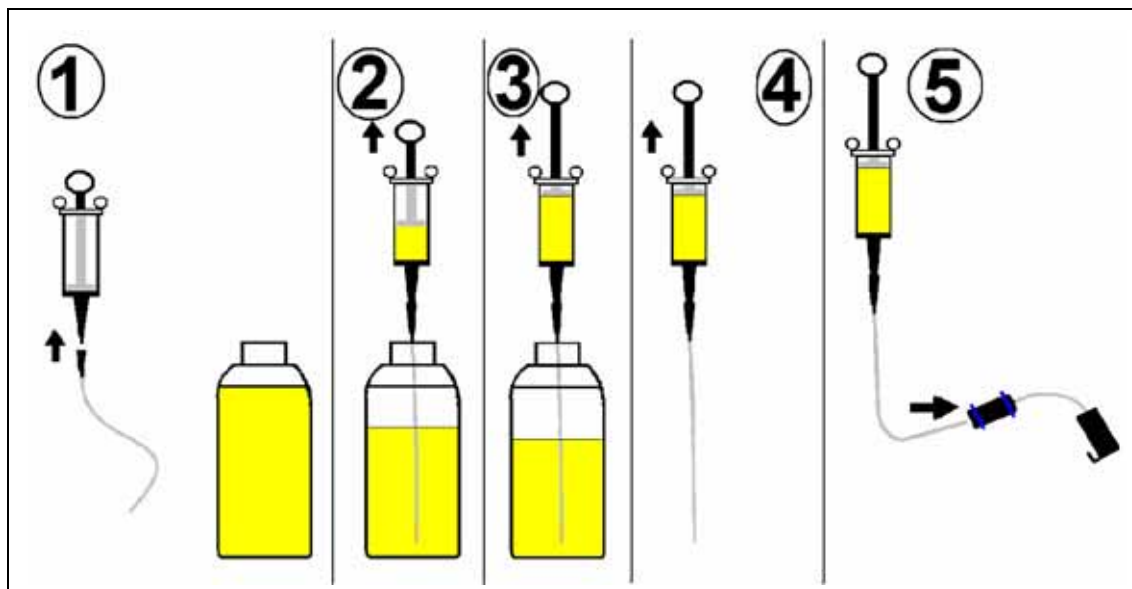
3.7 Antifoam cartridge preparation and installation

An empty 280mL volume antifoam cartridge is delivered as part of the installation kit. A recharge bottle of antifoam is part of the package along with the necessary tools to transfer the liquid to the cartridge (100mL volume syringe, tubing and connectors).

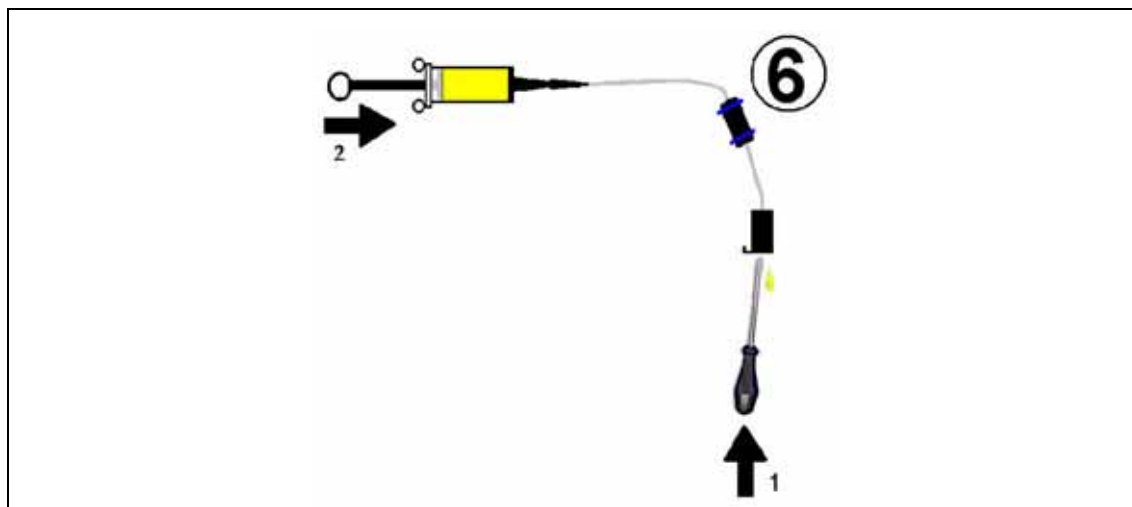
Important Note: To ensure the performance and reliability of the instrument, it is strongly recommended to **only** use the silicon antifoam supplied by Hach Lange (part number 33156).

3.7.1 Antifoam cartridge preparation

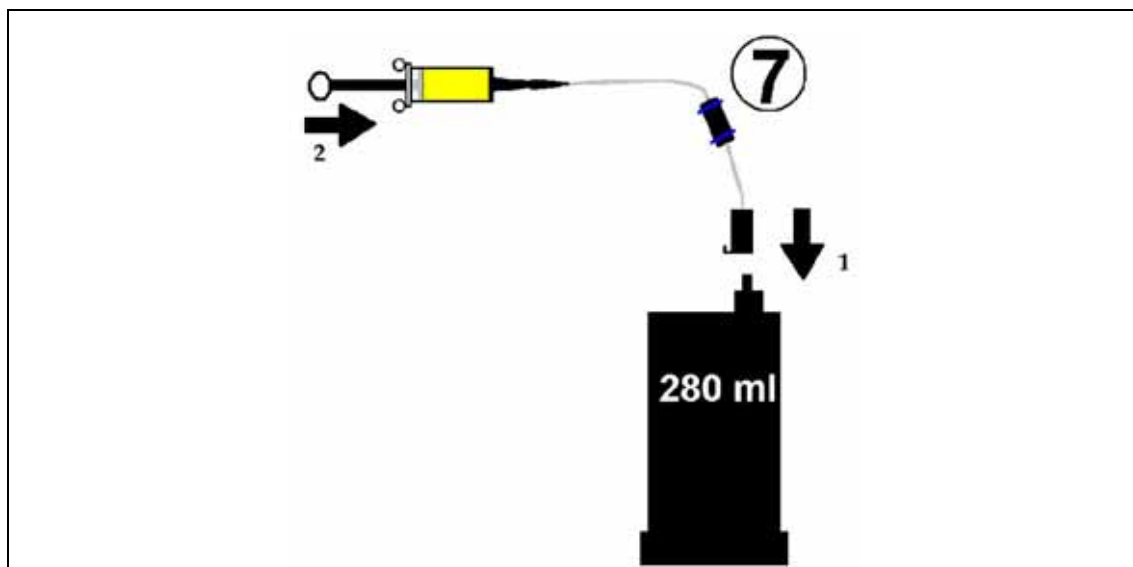
To fill the cartridge, proceed as follows (numbers in the boxes correspond to the steps):



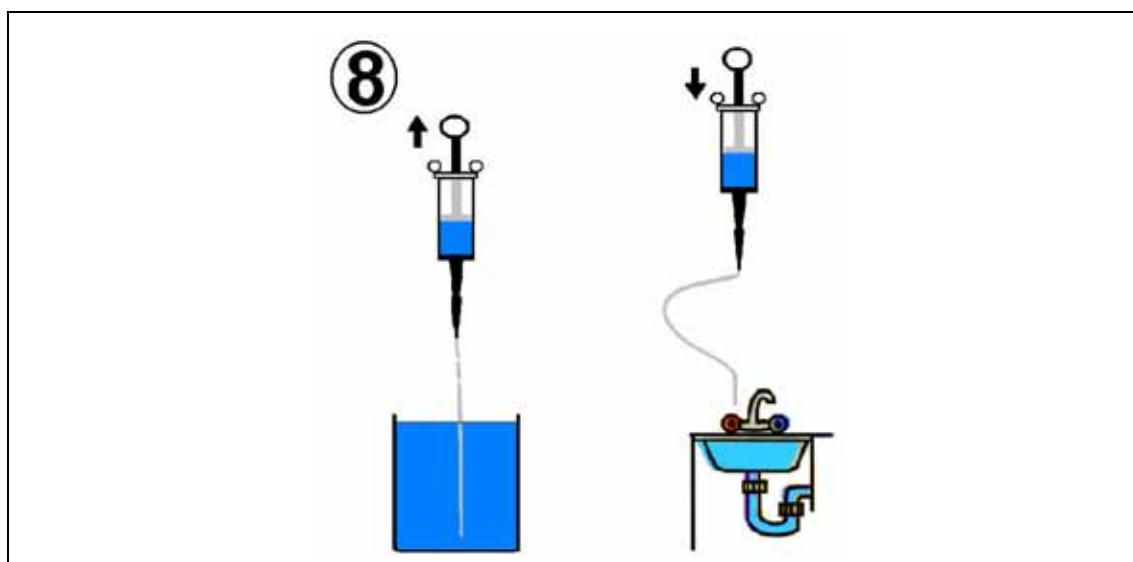
1. Connect the syringe to the tubing with the quick connector.
2. Unscrew the cap from the antifoam recharge bottle and put the tubing in, making sure it goes as near to the bottom of the liquid as possible.
3. Pull on the syringe to extract the liquid until the syringe is full.
4. Remove the syringe and tubing from the recharge bottle.
5. Attach the end of the tubing from the syringe to the other piece of tubing using the quick fit connector.



6. Remove any trapped air in the system by applying a small amount of pressure to the end of the connector with a small screwdriver (or similar) to open the valve. Push slightly on the end of the syringe until antifoam can be seen dripping out of the end of the connector. Remove the screwdriver.



7. Attach the end of the second piece of tubing to the antifoam cartridge by pressing until the connector clicks into place on the inlet valve. Then, push on the end of the syringe to empty the contents into the cartridge. The syringe has a volume of 100mL and the cartridge a volume of 280mL, so repeat the process 2 more times until the antifoam cartridge is full.



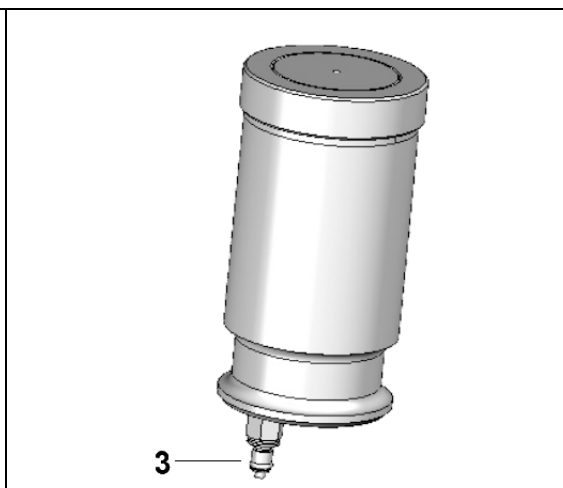
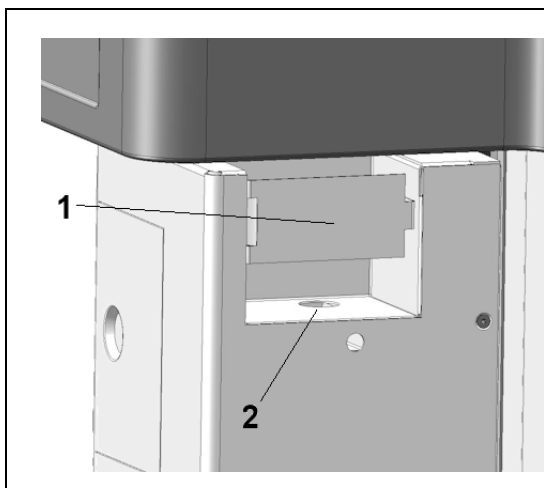
8. On completion, rinse out the syringe and all tubing with water. Screw the cap back onto the antifoam container and store the tools and container in a cool dry place.

Note: One antifoam recharge bottle should be enough to fill the cartridge at least 3 times.

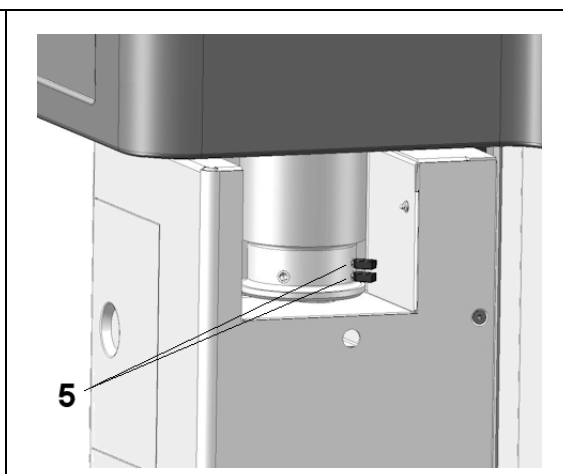
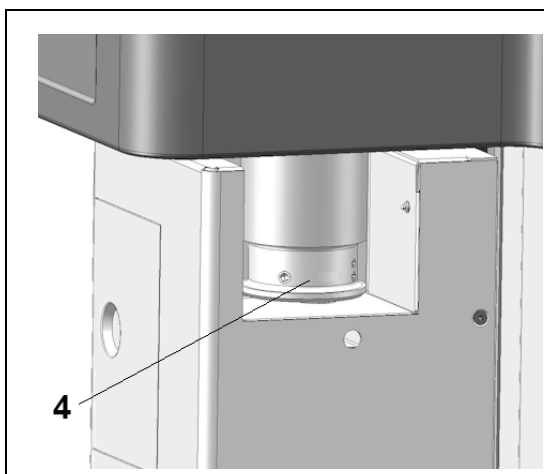
3.7.2 Antifoam cartridge installation

Install the cartridge as follows:

1. Lower the piercing device to its lowest point (it will stop automatically once this point is reached). If using the wizard, simply press the **Do It** key on screen. If not using the wizard, refer to [Manual displacement on page 80](#) for details.
2. Remove the plastic front protection door by carefully raising it up on its rollers and over the top of the instrument to give access to the antifoam cartridge location.
3. Open and remove the small front door (No. 1 in the diagram) for easy access to the antifoam cartridge chamber. Fit the cartridge in place by lining up the two fluid connectors (chamber connector shown as No. 2 in the diagram, cartridge connector as No. 3).



4. Press down gently and twist slightly (if necessary) until the cartridge clicks into place (No. 4 in the diagram) with the two connectors located towards the back.



5. Attach the two connectors (No. 5 in the diagram) to the pump leads inside the chamber (no specific polarity).
6. Return the small door to its original location and close to secure the chamber.

3.8 Oxygen sensor preparation and installation

3.8.1 Oxygen sensor preparation

Your A1100 electrochemical sensor has been thoroughly cleaned and tested at the factory before shipment. It has been shipped with a cartridge containing a membrane and electrolyte pre-installed to protect the sensor head. This cartridge must be removed (see [Oxygen sensor removal](#) process below) and replaced with a new one prior to first use to make it fully operational.

The new cartridge is included in the sensor recharge kit supplied with the instrument.

The sensor recharge kit also contains two protection caps, one with a grille and one without. Ensure you use the protection cap **with** a grille (illustrated right) for this instrument.

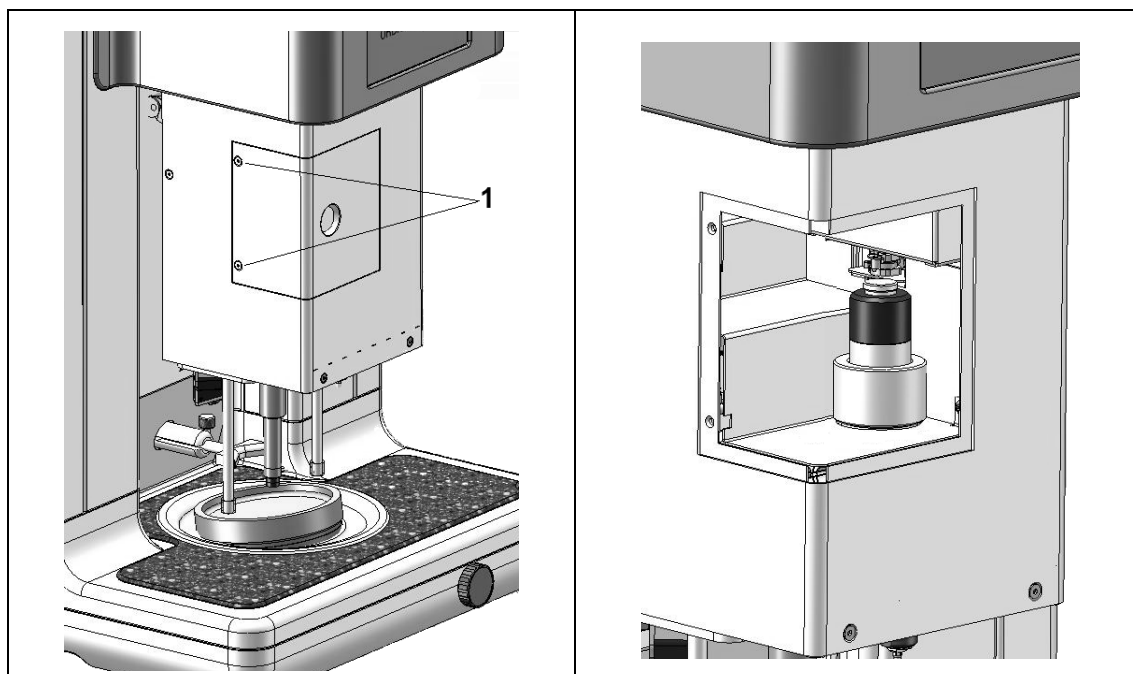


The sensor should be made operational before being installed in the instrument. To do this, follow the detailed instructions in **Section 4.1 (Sensor preparation)** of the **ORBISPHERE Model A1100 User Manual** supplied with the instrument. Should you have any questions, your Hach Lange representative will be pleased to help.

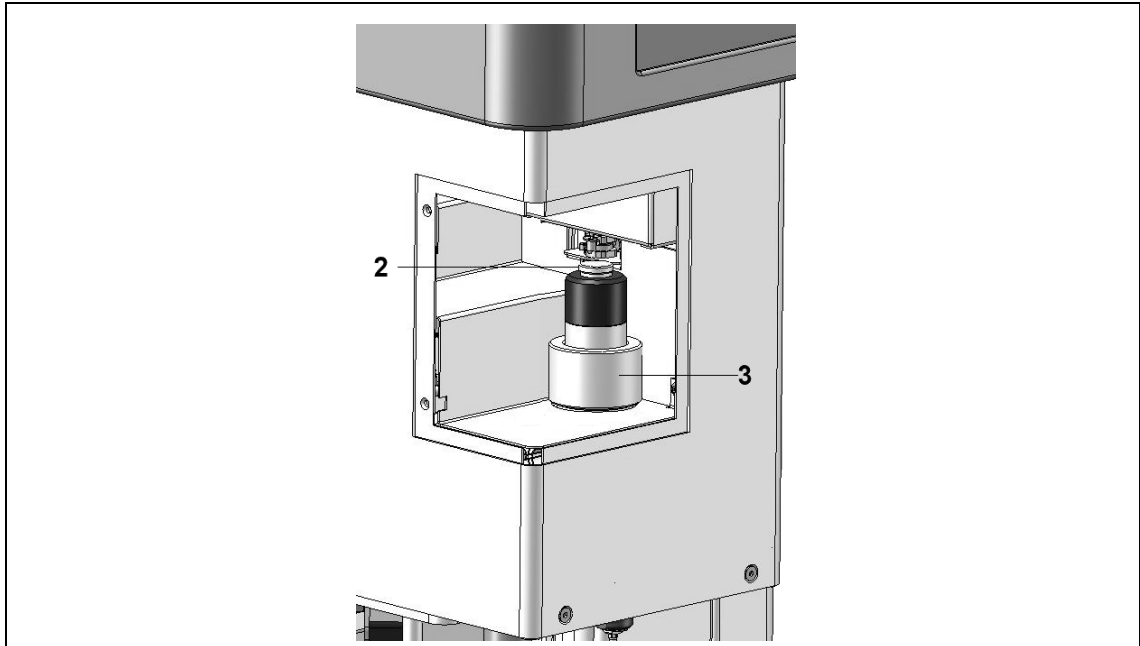
3.8.2 Oxygen sensor removal

To remove the oxygen sensor, following these simple steps:

1. With the plastic front door still removed and the measurement head at its lowest position, unscrew the two screws (No. 1 in the diagram below) holding the small sensor access panel and remove it to reveal the sensor.



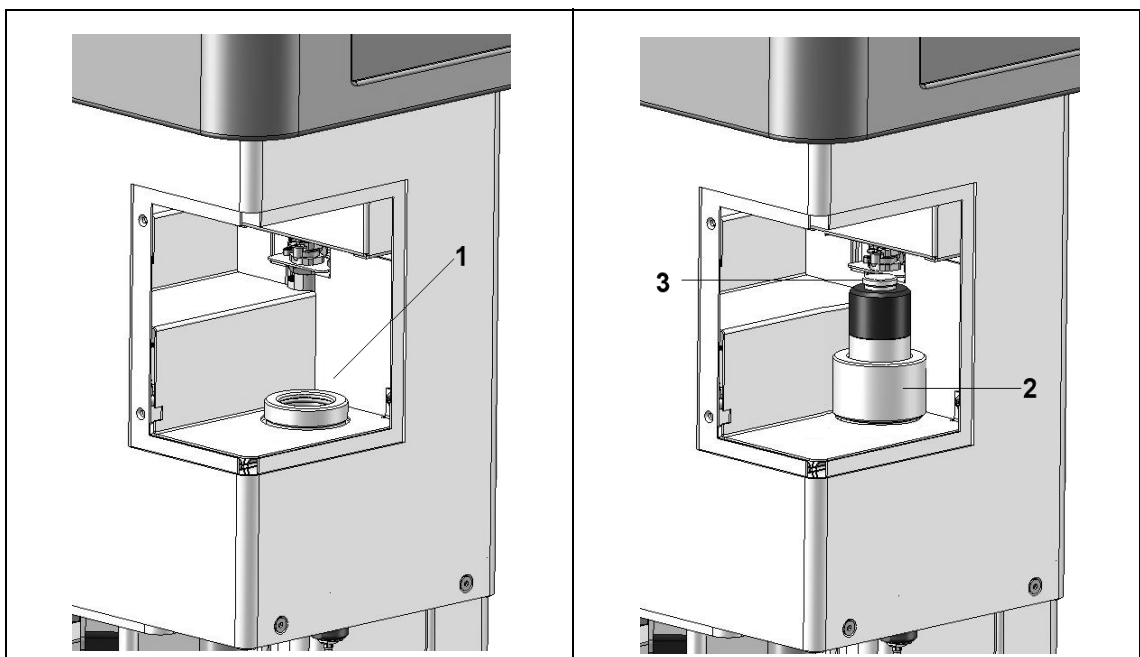
2. Disconnect the sensor cable (standard LEMO-10 plug-in connection) at the top of the sensor (No. 2 in the diagram) and unscrew the sensor locking nut (No. 3 in the diagram below). The sensor can now be removed from its position.



3.8.3 Oxygen sensor installation

Once the sensor is operational, it must then be re-installed in the instrument:

1. With the plastic front door and the sensor access panel still removed, and the measurement head at its lowest position, insert the sensor into the sensor socket (No. 1 in the diagram below) and screw the locking nut (No. 2 in the diagram below) finger tight to hold the sensor firmly in place. Connect the sensor cable to the top of the sensor (No. 3 in the diagram below) using the standard LEMO-10 plug-in connection, and hand tighten the cable collar.



2. Replace the sensor access panel and secure in place with the two screws.
3. The plastic front protection door can now be put back in place by lowering it down over the instrument, ensuring the rollers are correctly located inside the slots on each side.

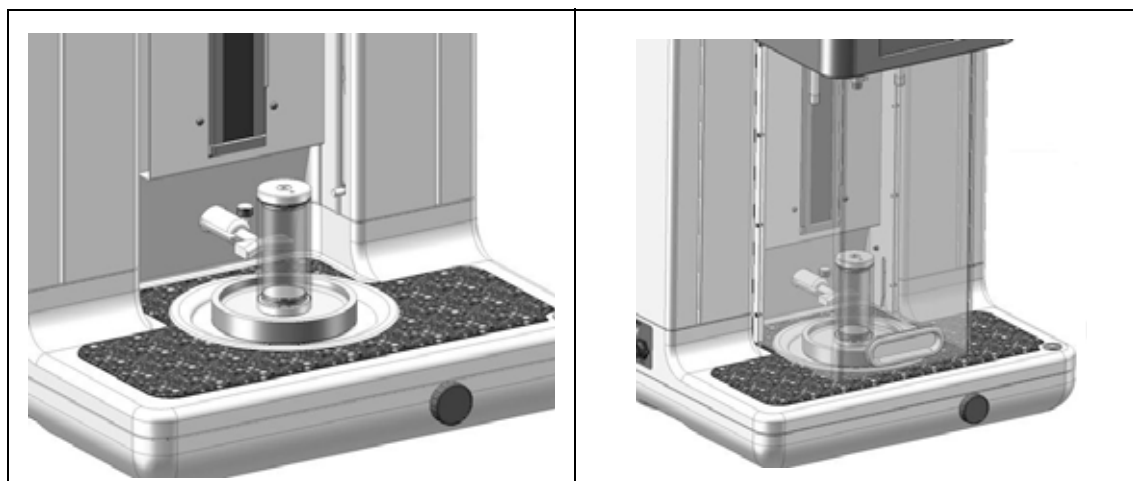
CAUTION

Ensure the rollers are correctly positioned inside the slots before slowly and carefully lowering the door. Incorrect positioning and/or forcing the door down could easily damage the exterior housing of the instrument.

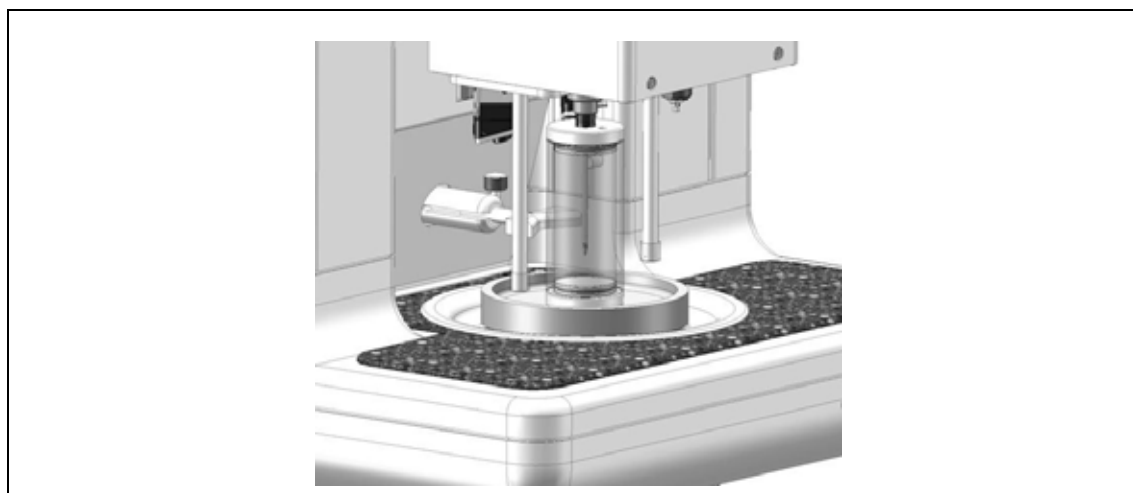
4. Manually raise the piercing device back to its upmost (home) position. Refer to [Home position on page 79](#) if you are unsure how to do this.

3.9 Prime the antifoam tubing

1. An antifoam priming tool is available from the spares kit delivered with the instrument. Place this on the ultrasonic base of the instrument, using the lasers to center it (illustrated below left) and lower the plastic front door (illustrated below right).



2. Activate the motor to lower the instrument head, allowing the needle to penetrate approximately to the center of the priming tool (illustrated below). If using the wizard, simply press the **Do It** key on screen. If not using the wizard, refer to [Manual displacement on page 80](#) for details on lowering the instrument head.



3. Start the antifoam pump to prime the tubes and continue until the white antifoam liquid starts to appear from the needle. If using the wizard use the on-screen **Start** and **Stop** buttons to control this. If not using the wizard, refer to [Antifoam system on page 81](#) for details and press the **Start injection** button to control the liquid output.
4. Raise the instrument head to its home position (**Do It** key with the wizard or [Manual displacement on page 80](#) otherwise). Remove the priming tool and rinse well with water. Store with the syringe and antifoam container for next usage.

3.10 Run instrument auto-check

If using the installation wizard, an instrument auto-check is run automatically on completion of the installation steps.

If not using the wizard, select the **System initialization** option in the **Maintenance Menu** to perform a standard system startup (see [System initialization on page 83](#)).

Verify the results of the auto-check. See [Instrument startup on page 29](#) for a more detailed explanation of the auto-check process and results.

Section 4 User Interface and Startup

4.1 User interface

4.1.1 Instrument

The instrument front panel is comprised of a touch screen acting as display, touch pad and keyboard.

Turning the instrument ON and OFF

Note: It is recommended to keep power supplied to the instrument at all times, unless the instrument is to be moved to another location, if it will not be used for a long period of time (e.g. vacation period), or if maintenance procedures need to be carried out inside the instrument.

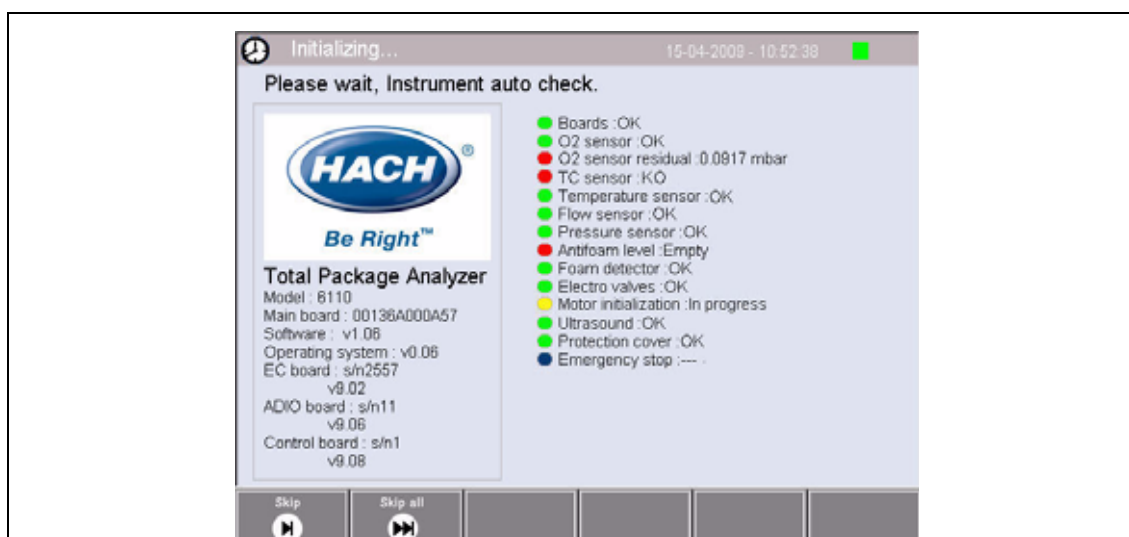
The instrument has a power switch located on the left side of the base. A LED on the instrument measurement start button (No. 5 in [Figure 2 on page 14](#)) indicates when the instrument is powered on.

4.2 Instrument startup

When the instrument is powered **ON**, an initial splash screen is displayed showing the company logo and instrument model number. The instrument then goes through a number of startup procedures to check all components are installed and functioning correctly.

Important Note: Once the instrument is switched on you will need to wait until the O2 sensor residual value reaches the threshold of 0.1 mbar. This operation can take up to two hours depending on the instrument and sensor conditions prior to startup.

A number of instrument parameters are also displayed down the left side of the screen indicating the current software and board versions installed:



The right side of the screen lists each of the instrument components that are checked, and a colored indicator to the left of each component shows the current status:

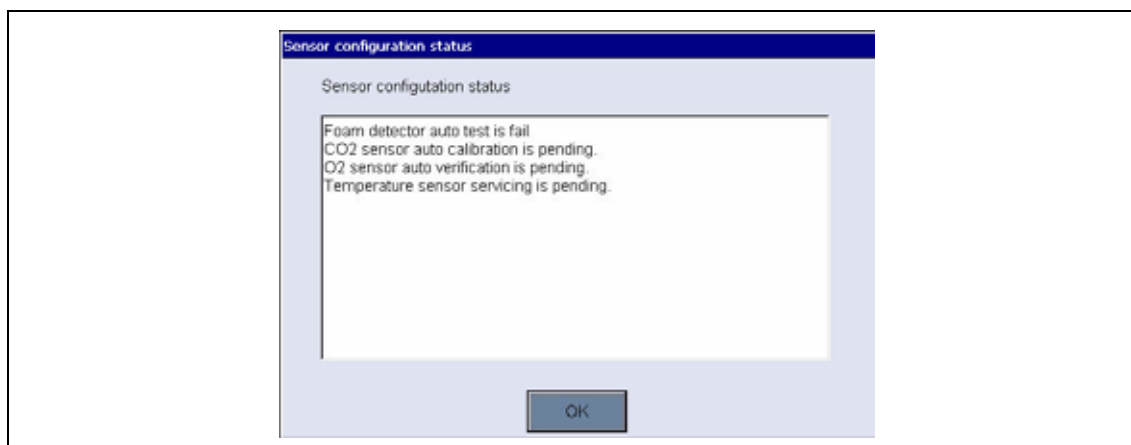
- A green indicator means that the component is installed and working correctly
- A red indicator means that there is a problem with that particular component
- A yellow indicator means that the component is in the process of being checked
- A blue indicator means that the component has not yet been checked

A colored LED indicator on the top right of the header banner will indicate the current status of the instrument with regards to the sensor and hardware configuration:

- A green indicator means that no problems have been encountered
- A yellow indicator means that a sensor service or calibration is required, or that an automatic planned task (e.g. sensor calibration or verification) is required and which will be activated the next time the instrument is in standby mode
- A red indicator means that there is a problem with the sensor or hardware configuration, or that the instrument is not ready (e.g. oxygen level is too high)

For detailed information on the sensor configuration options, refer to [Sensor configuration on page 50](#).

If the LED indicator is not green, then pressing on this will display a list of configuration errors or warnings as in the example below:



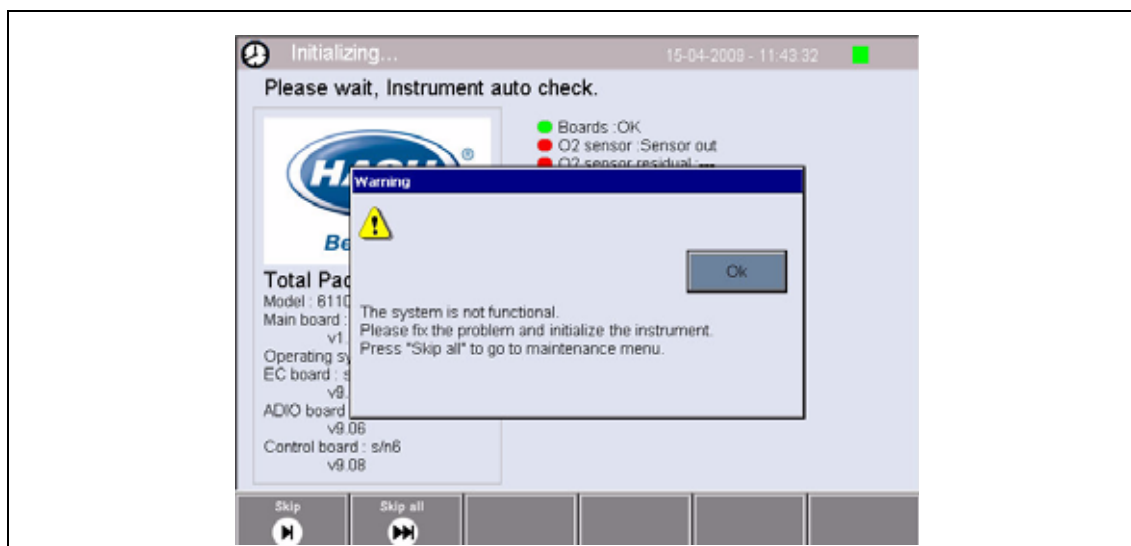
It is advisable to correct all of the errors listed before continuing, to ensure the instrument is working correctly. It is not recommended to continue if the LED is showing red (see [Red LED's on startup screen on page 89](#) for assistance).

Note: On instrument startup for the **first** time, the **O2 sensor residual** and the **Antifoam level** LEDs will always be red. This is normal as the system has not yet been fully commissioned, and these red LEDs can be ignored at this stage.

On completion of all startup checks you may be required to enter a valid identification number and password (as described in [User identification and access level on page 32](#)) to continue.

Provided all startup checks were successful, the measurement screen will be displayed.

If there are errors encountered on startup that mean the instrument cannot function correctly, a warning screen will be displayed indicating the next course of action:



In the above example, the recommended action is to press the **Skip all** button which will then take you to the maintenance screen so the problem(s) can be diagnosed and corrected. You may be required to enter a valid identification number and password to access the maintenance screen.

4.2.1 Instrument options

A footer banner will be displayed on each screen showing the options available:



Press the **Standby** button to leave the instrument in operational mode if there is a long time delay between measurements. In this mode, and if automatic operation settings have been configured (see [Sensor configuration on page 50](#)), the system performs verification processes in order to guarantee the instrument status and therefore the quality of the package analysis. The screen will go blank, but can be reactivated by tapping it. Once reactivated, you will need to enter a valid user ID and password combination if this has been set up.

For detailed information on the other options refer to:

- Configuration - [Configuration on page 35](#)
- Calibration - [Calibration on page 53](#)
- Measurement - [Measurement on page 63](#)
- Analysis - [Analysis on page 69](#)
- Maintenance - [Maintenance on page 71](#)

4.2.2 Touch screen

The user interface on the front panel is a TFT VGA (640x480) color display with touch screen. To make navigation user friendly, the interface software is Windows CE based, providing easy selection through menus.

4.2.3 Virtual keyboard

When a text box (alphanumeric field) is selected for data entry, a virtual keyboard appears on screen as illustrated below. This is used in a similar way to a standard PC keyboard.



Once values have been entered, press the **Enter** key on the right of the keyboard to confirm input and exit the virtual keyboard. During editing, the edited field name is displayed, along with units where applicable.

Note: Use the **Cap** key at the bottom left of the keyboard to switch between upper and lower case characters. This is important for case-sensitive information such as passwords.

4.2.4 User identification and access level

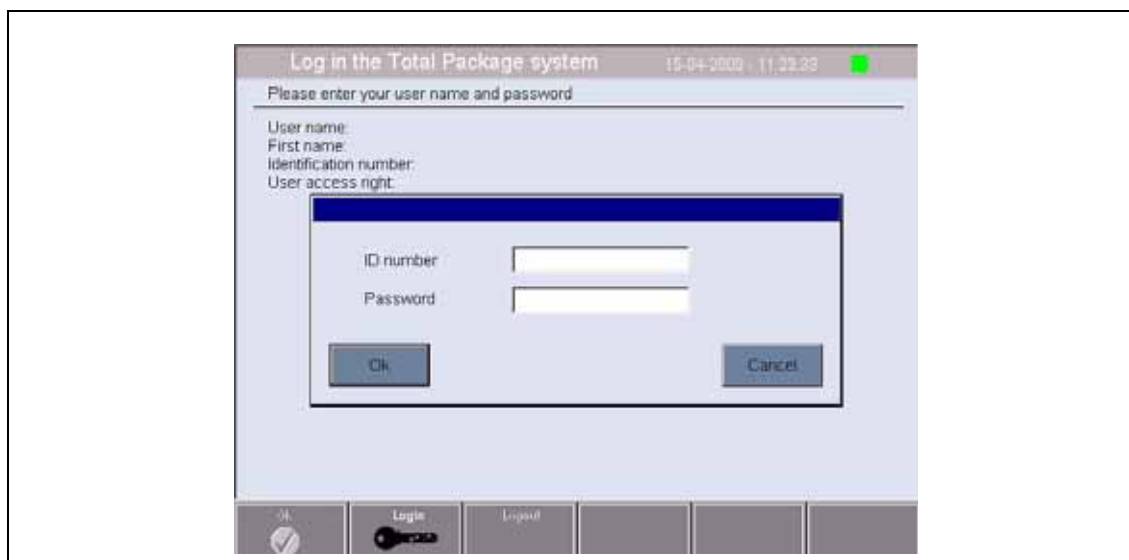
If access rights have been enabled, it will be necessary to log on as an authorized user to get access to the instrument functionalities and settings (see [Security and user management on page 43](#) to set these up).

By default, three levels of user have been defined for the instrument, and will be required on first access to the instrument:

Name	First name	ID	Password	Level
Administrator	Administrator	000	123	Administrator
Manager	Manager	001	123	Manager
Operator	Operator	002	123	Operator

After setting up your own user list, these three default entries should be removed.

First press **Login** at the bottom of the screen to access the full login screen:



Enter your identification and password in the boxes provided, and press **Ok** to continue. Your details will be displayed at the top left corner of the screen. Then press the **Ok** button at the bottom left of the screen to gain access to the main menu.

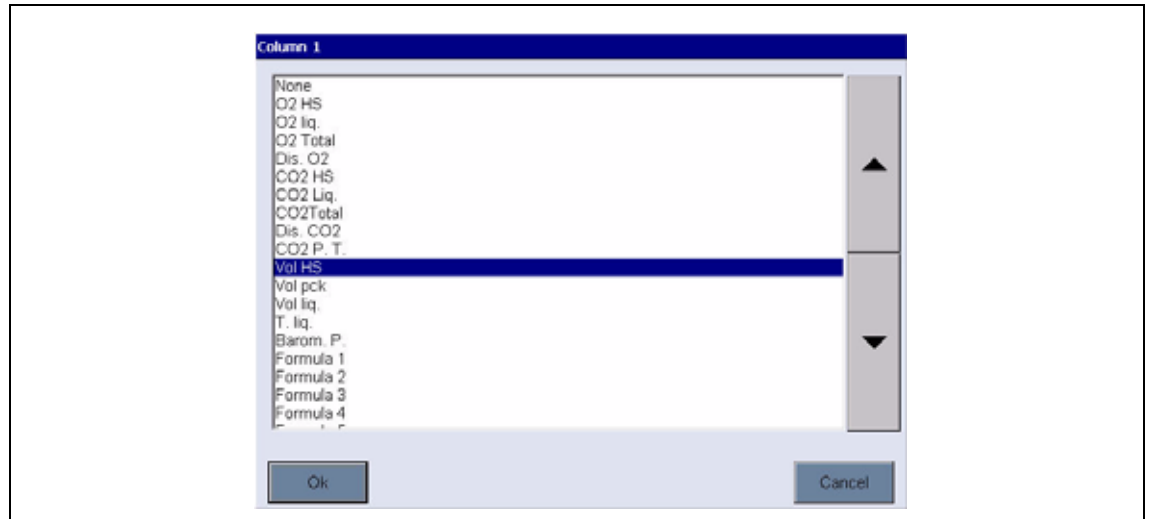
There are three user access levels:

Level	Available options
Administrator	Configuration, Calibration, Measurement, Analysis and Maintenance
Manager	Configuration, Measurement, Analysis and Maintenance
Operator	Measurement and Analysis

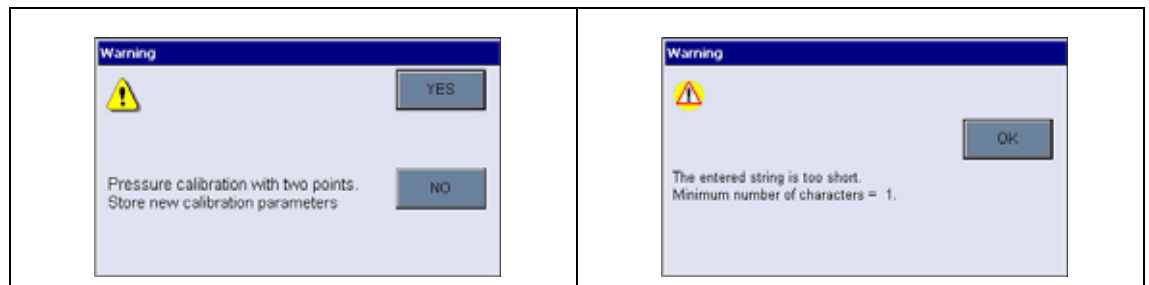
For security purposes, when the session inactivity delay period has expired (adjustable using the option [Security management on page 43](#)), the user is logged off automatically.

4.2.5 Rolling list

For convenience, selection through a possible large list of items has been designed with a rolling list, as in the example below. Use the up and down arrows at the side to navigate, or select one item directly and press **Ok**.



4.2.6 Warning windows

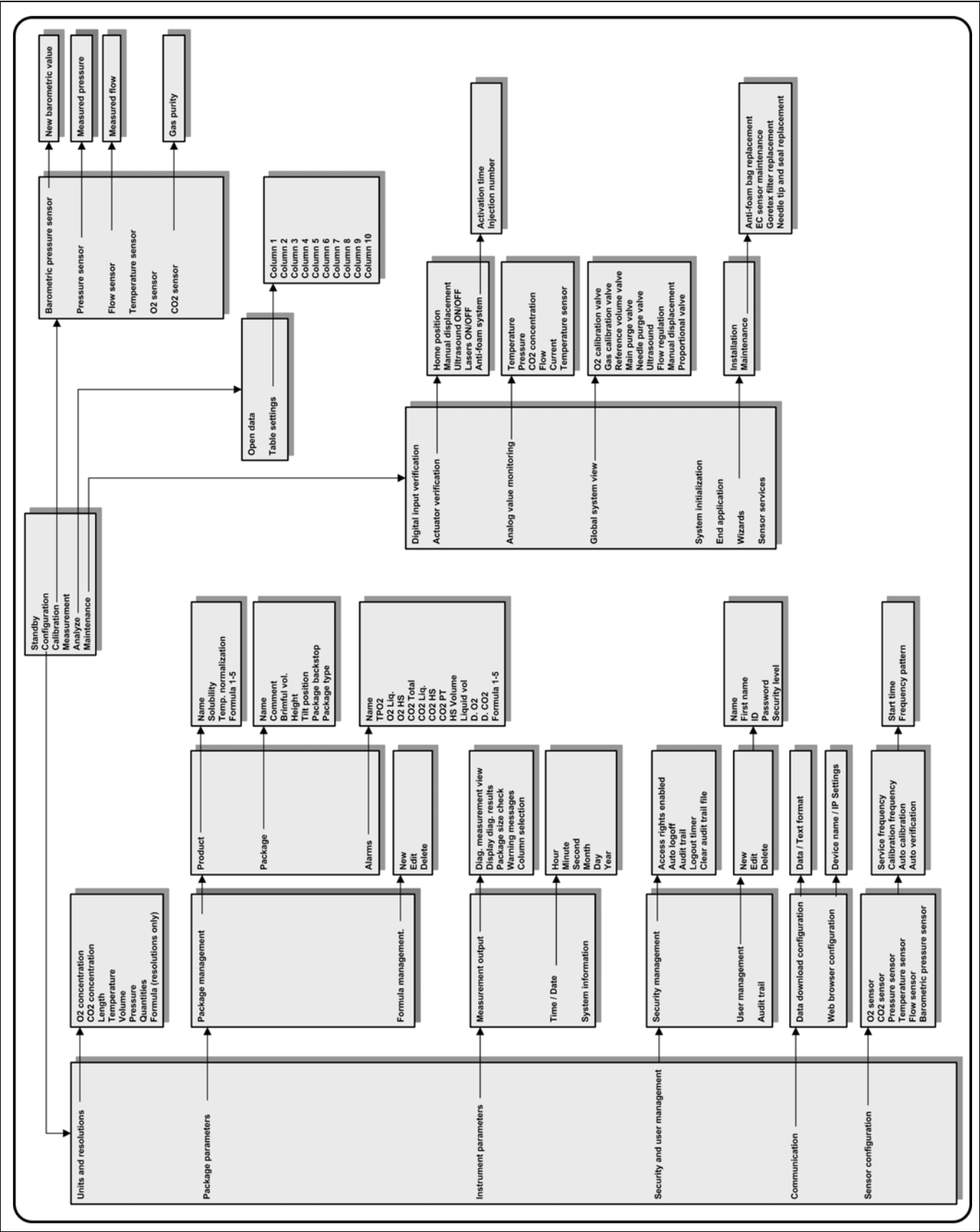


At various stages, a warning message may be displayed to request confirmation from the operator that his last action(s) must be applied, or that there is a problem that did not enable the requested action to be performed.

Note: Warning messages can be suppressed by unchecking the Warning messages parameter in [Measurement output on page 41](#).

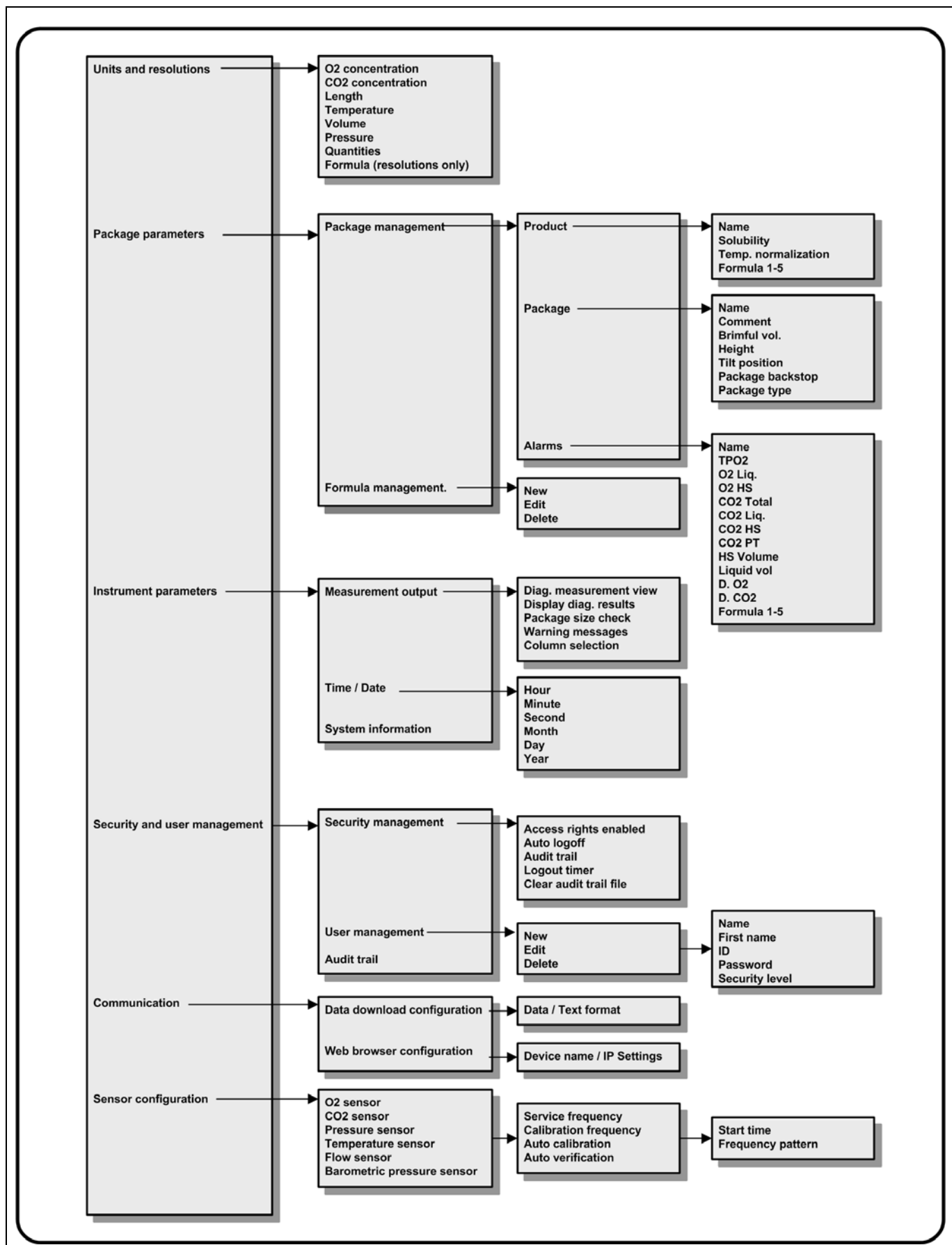
For a full list of all possible warning and error messages, and the recommended action to take, please refer to the section entitled [Troubleshooting on page 87](#).

4.3 Menu structure overview



Section 5 Configuration

5.1 Configuration menu overview

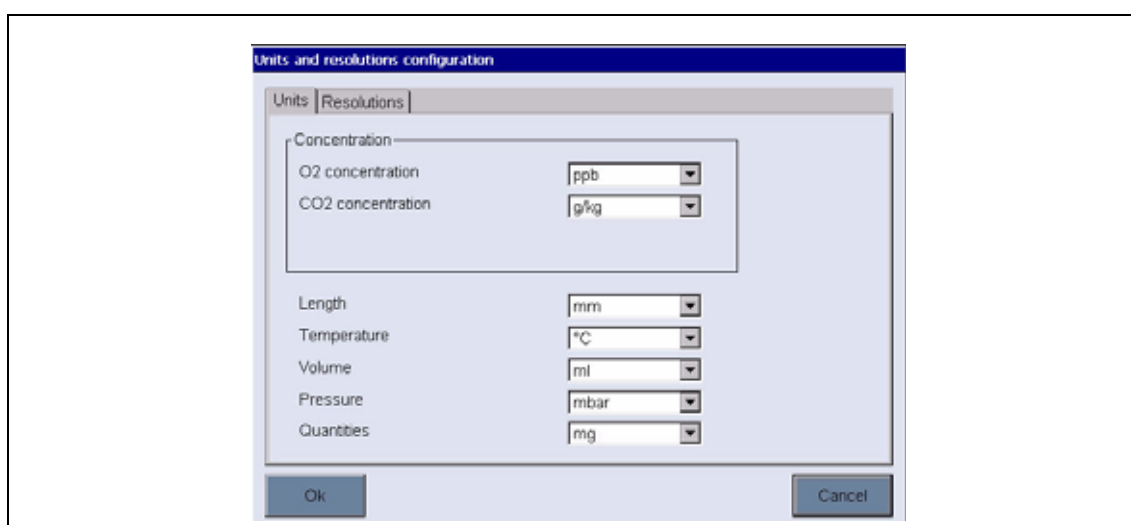


This section describes the sequence of actions required to configure the instrument. The following configuration options are available from the main screen:

- Units and resolutions
- Package parameters
- Instrument parameters
- Security and user management
- Communication
- Sensor configuration

5.2 Units and resolutions

5.2.1 Units

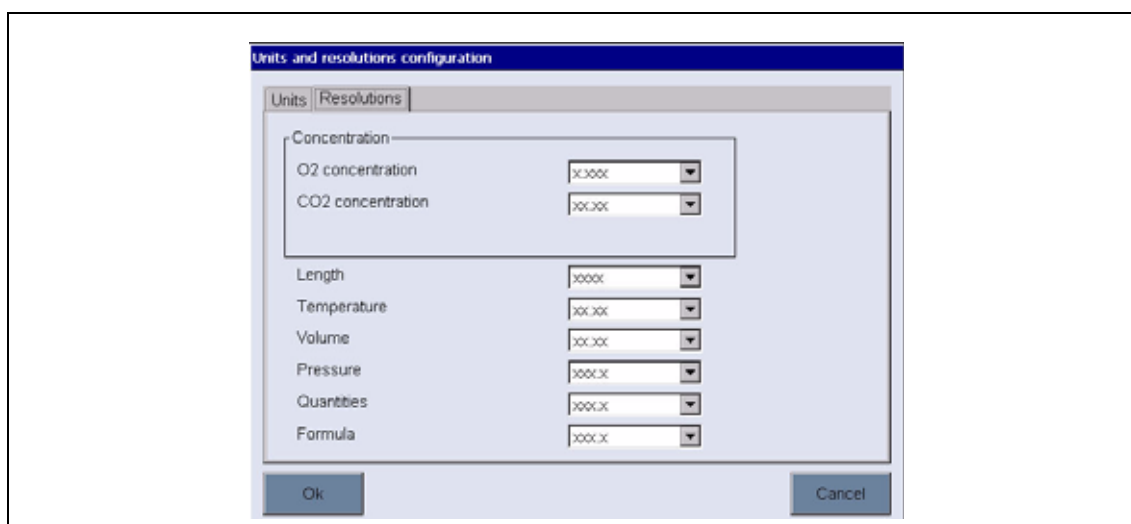


This option allows you to assign units to all values displayed by the instrument.

- For each value listed, a rolling list will be displayed giving the units valid for that particular parameter. Select the required unit from the list and press **Ok** to continue.

When all units have been assigned, press **Ok** on the main screen to save these values and continue.

5.2.2 Resolutions



Touch the **Resolutions** tab on the screen to define the display resolution for all values displayed by the instrument.

- For each parameter listed, a rolling list will be displayed giving the available display resolutions. A maximum of 4 digits and a decimal point can be displayed. Decimals can be limited to 0, 1, 2, or 3 for easier reading. This does not affect the actual resolution of data measured and stored, only the data displayed on screen. Select the required resolution from the list and press **Ok** to continue.

When all display resolutions have been defined, press **Ok** on the main screen to save these values and continue.

Note: The instrument performance and specifically the sensitivity and accuracy of each measured parameter is not affected by the choice of resolution. This is purely for screen display purposes. Refer to [Technical specifications on page 11](#) to view the accuracy of each measured parameter.

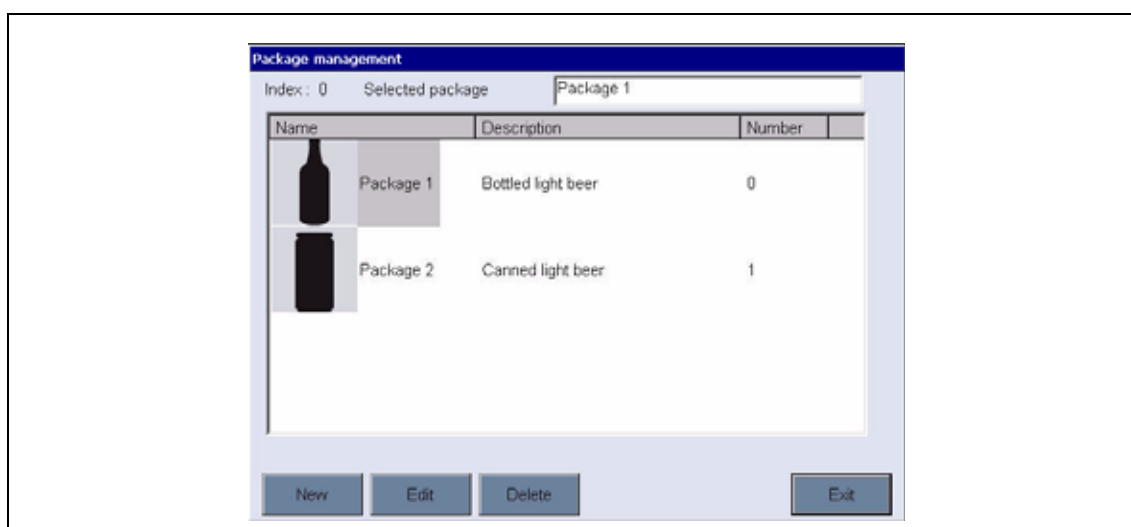
5.3 Package parameters

Select from:

- Package management
- Formula management

5.3.1 Package management

This option allows you to add new package definitions (up to a maximum of 100), and edit or delete existing definitions. When selected a screen is displayed listing all existing packages:



Press the **New** button to create a new package. The new package will be created using the default package parameters. You will then need to select the new package and edit these default parameters to define the new package parameters.

To edit or delete a package, first select the package from the list displayed by touching the package name on the screen, and then press either **Edit** or **Delete** as appropriate.

If **Delete** was selected, confirm the deletion to delete the package from the list.

If **Edit** was selected a new screen is displayed to allow you to change the definition of the package. Select each tab in turn to define the package definitions.

Product tab

The screenshot shows the 'Edit package' dialog box with the 'Product' tab selected. The 'Index' is 0 and the 'Name' is 'Package 1'. The 'Solubility' dropdown is set to 'Water'. The 'Formula selection' section contains five dropdowns: 'Formula 1' is 'Temp. average', and 'Formula 2' through 'Formula 5' are all 'None'. 'Ok' and 'Cancel' buttons are at the bottom.

- Name: Change the name of the package by selecting the box at the top of the screen and entering a free-format alphanumeric package description.
- Solubility: Enter the type of beverage in the package.
- Formula: Define up to five different formulae to apply to a measurement for computing a new parameter. The formula definitions must have been first entered into the system (see [Formula management on page 39](#) for details).

Package tab

The screenshot shows the 'Edit package' dialog box with the 'Package' tab selected. The 'Comment' field contains 'Bottled light beer'. The 'Brimful vol.' is 330.00 ml and 'Height' is 180.00 mm. 'Tilt position' is 1.0 and 'Pck backstop' is 2.0. The 'Package type' is 'Item 3', which is represented by a bottle icon. 'Ok' and 'Cancel' buttons are at the bottom.

- Name: Change the name of the package by selecting the box at the top of the screen and entering a free-format alphanumeric package description.
- Comment: Enter a free-format alphanumeric text. This text will appear against the package description in the main package management screen.
- Brimful volume: Enter the volume of the package when full to overflowing.
- Height: Enter the overall height of the package. This information is used if you activate the Package size check option in [Measurement output on page 41](#).
- Tilt position: Enter the tilt position of the package holder (optional).
- Pck backstop: Position of the package backstop (optional). The backstop is calibrated on a scale of zero to seven.
- Package type: Select from a scrolling list of images, the one that most resembles the type of package being measured (bottle, can, etc.).

Note: The above reference values are displayed at the start of the measurement process once a package has been selected, so the operator can adjust the instrument accordingly (tilt position, etc.).

Alarms tab

Index: 0 Name: Package 1

Product	Package	Alarms	Min	Max	Unit
<input type="checkbox"/> TPO2			0.0	10.0	mg
<input type="checkbox"/> O2 Liq.			0.0	10.0	mg
<input checked="" type="checkbox"/> O2 HS			2.000	10.0	mg
<input type="checkbox"/> CO2 Total			0.0	10.0	mg
<input type="checkbox"/> CO2 Liq.			0.0	10.0	mg
<input type="checkbox"/> CO2 HS			0.0	10.0	mg
<input type="checkbox"/> CO2 PT			0.00	10.00	g/kg
<input type="checkbox"/> HS Volume			0.00	10.00	ml
<input type="checkbox"/> Liquid vol			0.00	10.00	ml
<input type="checkbox"/> D. O2			0.000	10.000	ppb
<input type="checkbox"/> D. CO2			0.00	10.00	g/kg
<input type="checkbox"/> Formula 1			0.0	10.0	
<input type="checkbox"/> Formula 2			0.0	10.0	
<input type="checkbox"/> Formula 3			0.0	10.0	
<input type="checkbox"/> Formula 4			0.0	10.0	
<input type="checkbox"/> Formula 5			0.0	10.0	

Ok Cancel

- Name: Change the name of the package by selecting the box at the top of the screen and entering a free-format alphanumeric package description.
- Alarm parameters: Select the parameter for which you want to change the alarm settings, and enter the minimum and maximum values allowable for each parameter listed. When the measurement value falls below the minimum level and/or exceeds the maximum level for any parameter listed, an alarm will be triggered.

5.3.2 Formula management

This option allows you to add new formula definitions (up to a maximum of 40), and edit or delete existing definitions. You can use up to 14 variables pre-defined by the instrument and 2 user defined numerical variables that can be set up manually at the end of each measurement. These values can be entered into the **Num 1** and **Num 2** fields of the comments section on the measurement results screen (see example measurement screen on page 67).

When the option is selected a screen will be displayed listing all existing formulae:

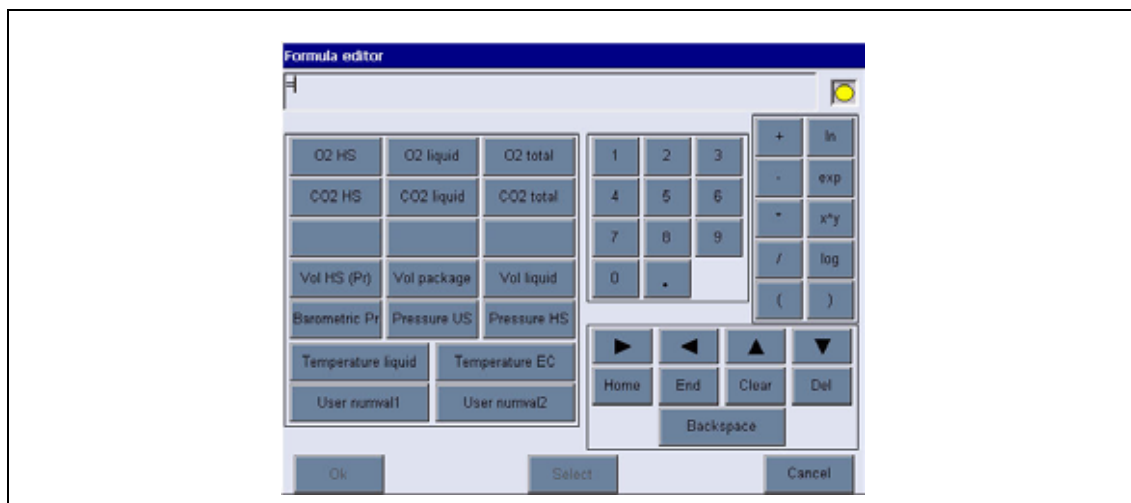
Nb	Formula name	Formula
1	Temp. average	((Temperature liquid+Temperature EC)/2)*2
2	Zero O2	(O2 HS+O2 liquid)-O2 total

New Edit Delete Info Exit

The **Info** button can be used to display information about the selected formula, such as the operator who created it, the date and time of creation (or the last edit), and any comments associated with it.

New formula

Press the **New** button to create a new formula. The formula editor screen is displayed:

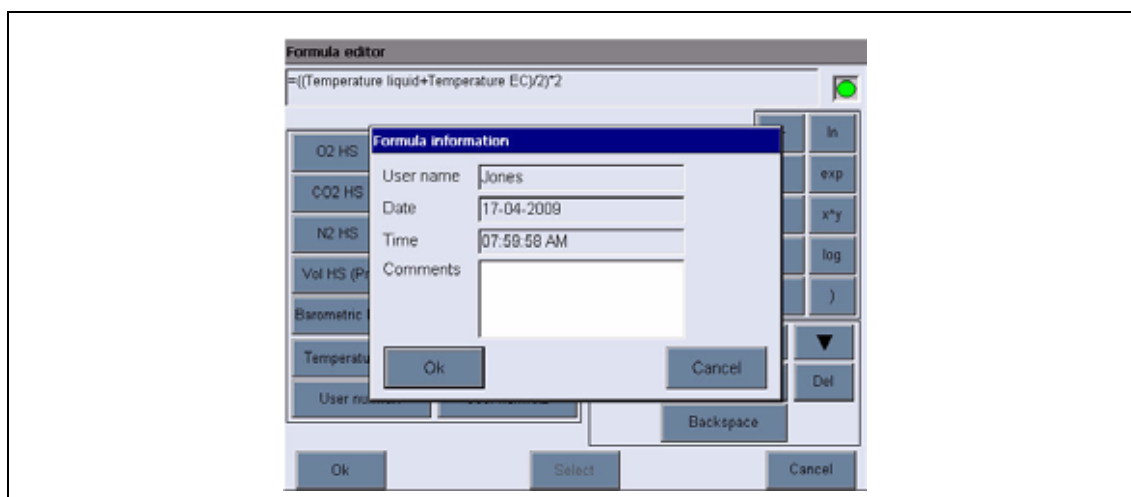


Use the editor to define a formula. The measurement values that can be used are listed down the left side of the screen and the operators and operands are listed down the top right. In the bottom right of the screen are a number of screen navigation options to assist in editing.

The colored indicator in the top right corner shows the validity of the formula as it is being created. It is initially colored yellow but will turn red if the formula is invalid and green when valid. When the indicator is red, the **Ok** button will be unavailable.

Use the **Select** button to select an existing formula to include in the new formula. The list of existing formulae is displayed as a rolling list.

When a valid formula has been entered, press the **Ok** button to continue. You are then requested to assign a name to the new formula, after which an information box is displayed showing the name of the user who created the formula and the date and time it was created. If required, add any free format alphanumeric text to identify the formula and press **Ok** to continue.



Edit or delete a formula

To edit or delete a formula, first select the formula from the list displayed and then press either **Edit** or **Delete** as appropriate. If delete was selected, you will be asked to confirm deletion before the formula is deleted from the list.

If edit was selected the formula editor screen is displayed to allow you to change the definition of the formula.

5.4 Instrument parameters

Select from:

- Measurement output
- Time / Date
- System information

5.4.1 Measurement output

Define the parameters shown on the screen after and during the measurement process:

- **Diagnostic measurement view:** Use this option to troubleshoot measurement problems. If this box is checked, then instead of the standard measurement progress screens being displayed during the measurement process, the measurement values are displayed instead (see example in [Measurement view on page 68](#)).
- **Display diagnostic results:** Use this option to troubleshoot measurement problems. If this box is checked, then instead of the standard measurement results screen being displayed at the end of the measurement process, more detailed measurement values are displayed instead (see example in [Results view on page 68](#)).
- **Package size check:** If checked, the instrument will verify that the package size is the same as that defined in the height parameter for the package being measured. If different a warning message will be displayed. The height detection resolution is 1 mm.
- **Warning messages:** If checked, any warning messages will be displayed during the package measurement process. If left unchecked, all warnings will be suppressed. For a full listing of possible warnings, refer to [Warning messages on page 88](#).

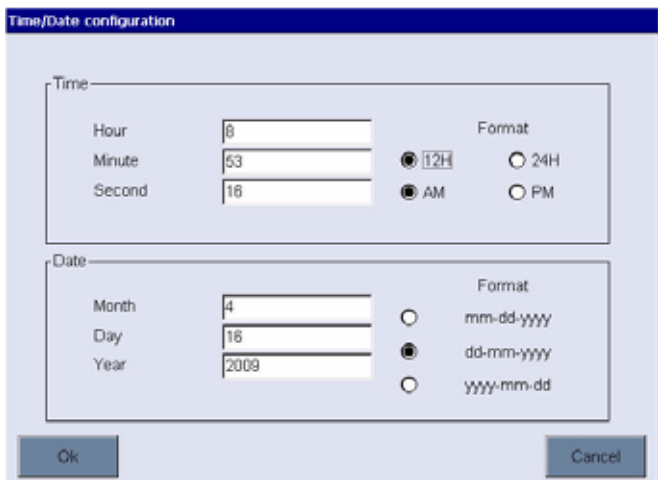
The **Column selection** defines the three measurements to display on the measurement results screen after the measurement process has completed (see screen example on page 67).

- **Column 1-3:** For each of the three columns, define the measurement to display from the drop down list.

When all details have been entered, select **Ok** to confirm.

5.4.2 Time and date

Use this option to set the system date and time parameters and the display format.




The 'Time/Date configuration' dialog box is divided into two sections: 'Time' and 'Date'. The 'Time' section contains input fields for Hour (8), Minute (53), and Second (16). It also has radio buttons for 12H (selected) and 24H, and AM (selected) and PM. The 'Date' section contains input fields for Month (4), Day (16), and Year (2009). It has radio buttons for three date formats: mm-dd-yyyy, dd-mm-yyyy (selected), and yyyy-mm-dd. At the bottom are 'Ok' and 'Cancel' buttons.

When all details have been entered, select **Ok** to confirm.

5.4.3 System information

Use this option to display the system information about the currently configured boards.



The 'System information' dialog box displays the following information:

Main board	
OS version:	0.06
TPA software version:	1.06
Board s/n :	00136A000A57

EC board	
Software version:	9.02
Board s/n :	2557

Control board	
Software version:	9.00

ADIO board	
Software version:	9.06

An 'Exit' button is located at the bottom right.

Select **Exit** to exit the screen.

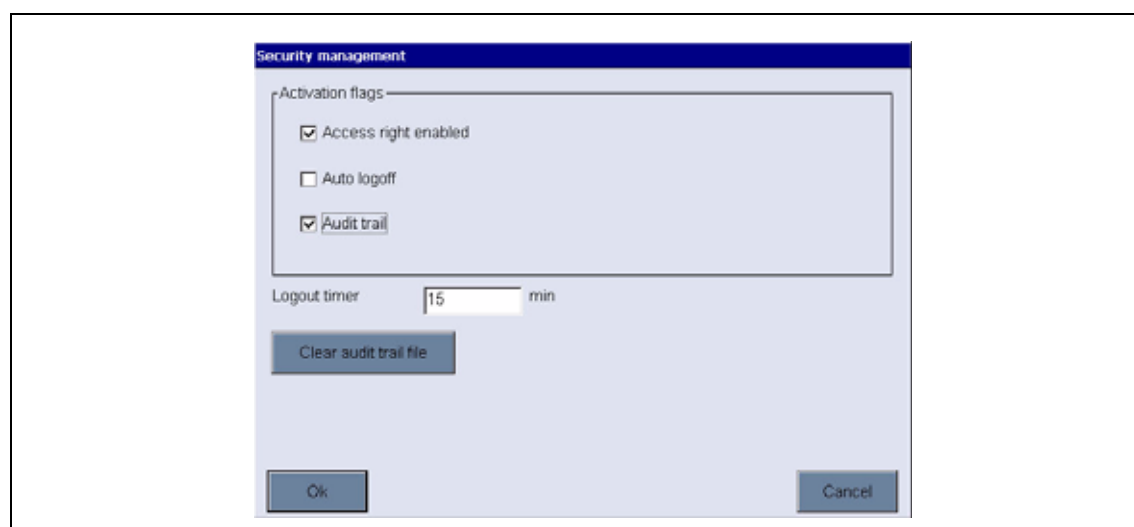
5.5 Security and user management

Note: When the instrument is started for the first time, security is disabled by default. To avoid any unauthorized access, it is highly recommended that each user be entered into the system and given appropriate access rights as soon as possible. Details are provided in this section.

Select from:

- Security management
- User management
- Audit trail

5.5.1 Security management




This option configures parameters related to confidentiality. Check the activation flags as required:

- Access rights enabled: When checked (recommended), it is required to log on as a registered user to access the menus. When disabled (default), all menus are access free and there will be no name recorded against any actions in the log file. To set up valid users, refer to [User management](#) on the next page.
- Auto logoff: When checked, the user is logged out automatically when the set delay for inactivity (Logout timer) is reached and the instrument goes on standby. When in standby mode, the instrument will trigger any outstanding automatic actions that have been set (e.g. sensor calibration, verification, etc.). See [Sensor configuration on page 50](#) for additional details.
- Audit trail: When checked, every action from a user is recorded in an audit file for traceability. These actions cover the configuration, calibration, and maintenance options. Each record holds the date and time of the action, the action ID and description, and the operator name and ID. The audit file is a rolling buffer recording the last 1000 actions.
- Logout timer: Enter a maximum time of inactivity (in minutes) for all users. Users are logged out automatically when the period of inactivity exceeds this value (provided the Auto log off feature is enabled).
- Clear audit trail file: This option deletes the audit file.

When all details have been entered, select **Ok** to confirm.

5.5.2 User management

When selected, the list of registered users for this instrument are displayed:



The 'User management' window displays a table with the following data:

N	Name	First Name	ID	Password	Level
1	Smith	John	1001	forest	Operator
2	Black	Steven	1002	wood	Supervisor
3	Green	Peter	1003	trees	Manager
4	Jones	Paul	1004	shrub	Administrator


At the bottom of the window are buttons for 'Ok', 'New', 'Delete', 'Edit', and 'Exit'.

You can then:

- Add **New** users
- **Delete** existing users
- **Edit** existing users

Note: To have the **Delete** and **Edit** options available, select one of the existing users first.

To add a new user, all of the following fields must be completed:



The 'Add a new user' window contains the following fields:

- Name:
- First Name:
- ID:
- Password:
- Security level:

Buttons for 'Ok' and 'Cancel' are at the bottom.

- Name: Enter the user surname (3-15 characters).
- First Name: Enter the user first name (3-15 characters)
- ID: Enter an alphanumeric ID (1-10 characters).
- Password: Enter an alphanumeric password (3-15 characters).
- Security level: Select the security level from the drop-down list. For a list of options available at each level refer to the following table:

Level	Available options
Operator	Measurement and Analysis
Supervisor	Calibration, Measurement, Analysis and Maintenance
Manager	Configuration, Calibration, Measurement, Analysis and Maintenance
Administrator	Configuration, Calibration, Measurement, Analysis and Maintenance

When all details have been entered, select **Ok** to add the new user.

To remove or modify an existing user, select the user in the user management screen and select **Edit** or **Delete** as appropriate.

To save all changes, press on the **Ok** button (you will be required to confirm the changes) or press the **Exit** button to exit the screen without making any changes.

Note: The maximum number of permitted users is 99.

5.5.3 Audit trail

This option allows you to view the list of user actions performed on the instrument:

Audit trail report				
1 - 13 of 28				
NO	DD-MM-YYYY	HH:MM:SS	Action ID	Description
1	17-04-2009	08:22:26 AM	61715	Package 1 Package is modified.
2	17-04-2009	08:22:26 AM	158	Edit package
3	17-04-2009	08:13:06 AM	61715	Package 1 Package is modified.
4	17-04-2009	08:13:06 AM	158	Edit package
5	17-04-2009	08:04:03 AM	1592	Zero O2 Formula is created.
6	17-04-2009	08:02:34 AM	1592	Temp. average Formula is created.
7	17-04-2009	07:55:53 AM	61716	Test Package is deleted.
8	17-04-2009	07:55:44 AM	61714	Test Package is created.
9	17-04-2009	07:54:08 AM	61715	Package 2 Package is modified.
10	17-04-2009	07:54:07 AM	158	Edit package
11	17-04-2009	07:52:53 AM	61715	Package 1 Package is modified.
12	17-04-2009	07:52:53 AM	158	Edit package
13	17-04-2009	07:01:56 AM	240	Time/Date configuration

Note: The actions are listed chronologically with the latest action always at the top of the list. When the maximum of 1,000 recorded actions is reached, the oldest is deleted and replaced with the latest.

Scroll through the audit trail screens using the **First**, **Previous**, **Next** and **Last** buttons, or select the **Exit** button to leave this option.

Note: To clear the audit trail file, use the option available on the main security screen (see [Security management on page 43](#)).

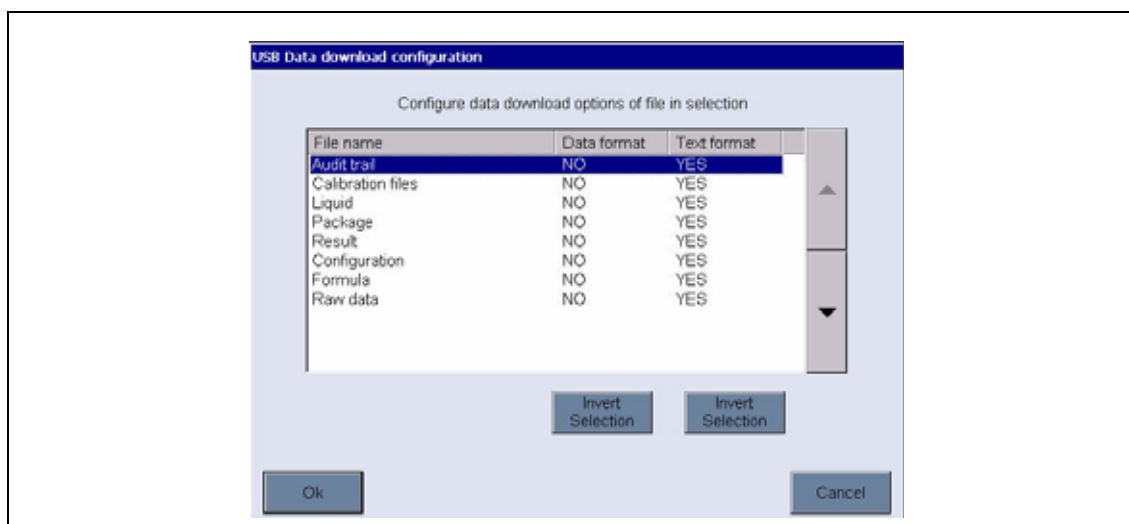
5.6 Communication

This option sets the parameters required for exporting instrument data files to your PC or USB storage device.

Select from:

- Data download configuration
- Web browser configuration

5.6.1 Data download configuration



Scroll through the list of available data files using the up/down arrow keys on the right, and select if the file to be exported is in data or text format. By default, the text format is set to **YES** and the data format to **NO**. Set both formats to **NO** if you do not require the file downloaded. Use the **Invert Selection** button under each column to toggle between **YES** and **NO**.

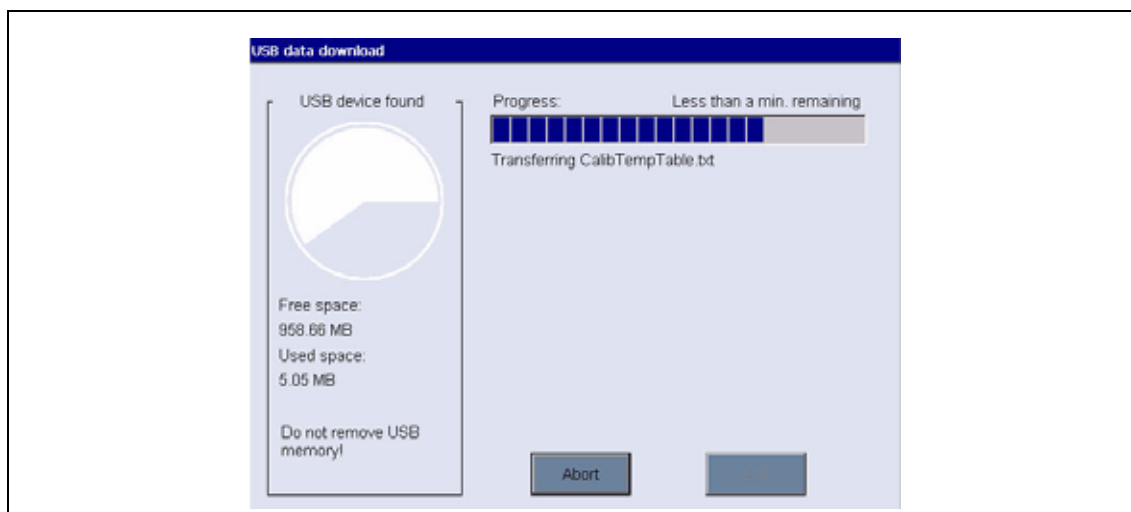
Note: It is recommended to set the files to text format for easy loading into standard software applications on the PC such as Microsoft Excel or similar. The data format is only required for Hach Lange service and support personnel.

When the data formats have been configured, select **Ok** to confirm.

The following files can be transferred:

- Audit trail: **Audit trail.txt**
- Calibration files: **Calib Barometer.txt**, **Calib CO2.txt**, **Calib Flow.txt**, **Calib O2.txt**, **Calib Pressure.txt** and **Calib Temperature.txt**
- Liquid: **Liquid.txt**
- Package: **Package.txt**
- Result: **Result.txt**
- Configuration: **Configuration.txt**
- Formula: **Formula.txt**
- Raw data: **Raw data.txt**

To transfer the data files, plug an external mass storage device (such as a USB memory stick) into one of the two USB-A ports at the rear left of the instrument. The instrument will recognize the presence of the device and the following screen will be displayed as the files are automatically copied:

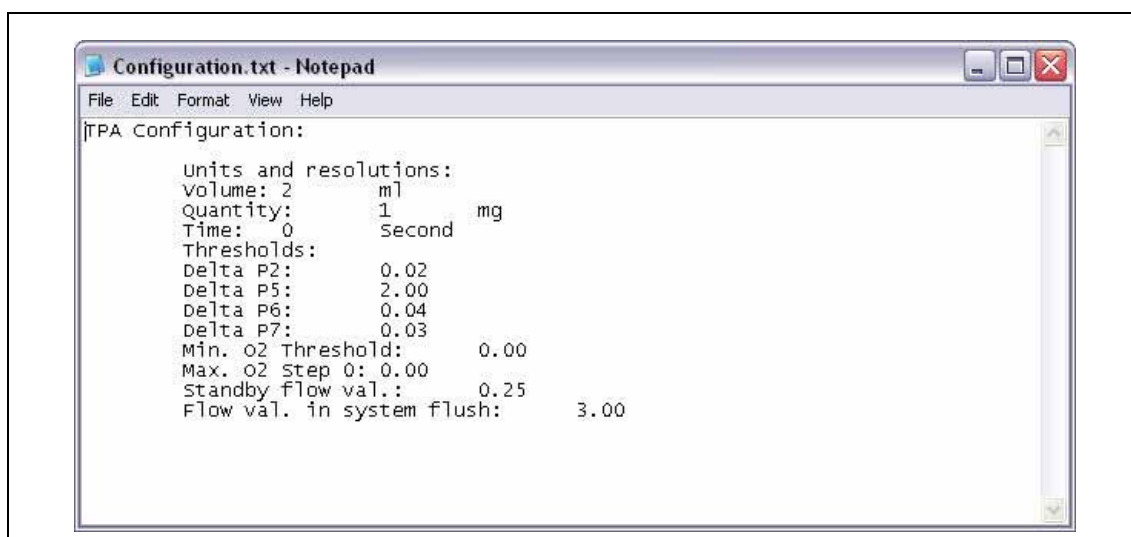


On completion a pop-up window will inform you the process completed successfully and you can remove the device. Remove the device and press YES in the pop-up window to continue, followed by EXIT in the main window to complete the process.

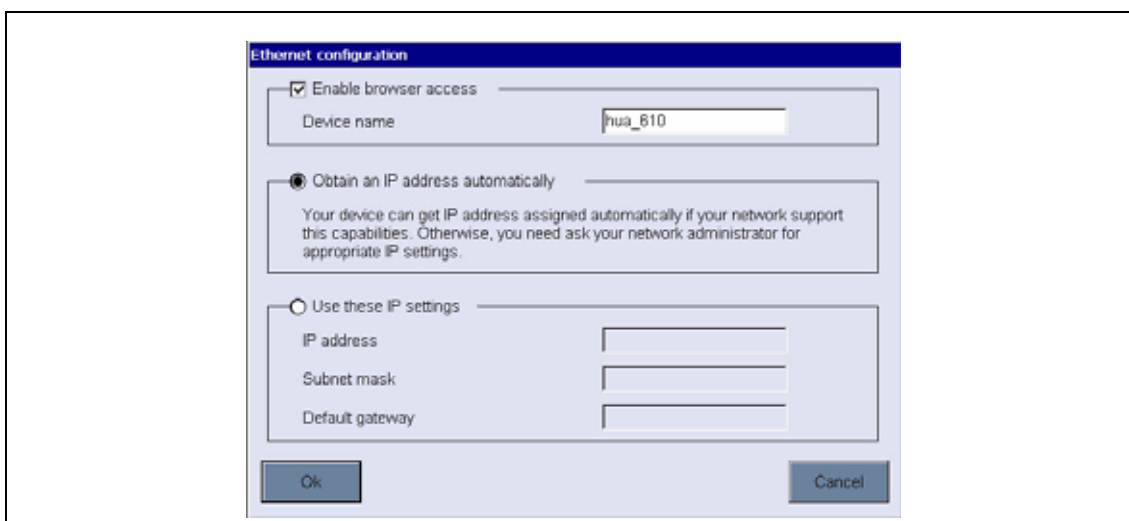
Next, insert the device into an available USB port on your computer and download the data to an appropriate folder using standard computer software.

The text files (with a **.txt** file extension) are in a readable format on a PC and most document editors (MS Word, Notepad, etc.) can be used to open these files as well as spreadsheet and other reporting tools (e.g. MS Excel).

The following is an example of the instrument configuration report (**Configuration.txt**) as viewed using the Notepad utility.

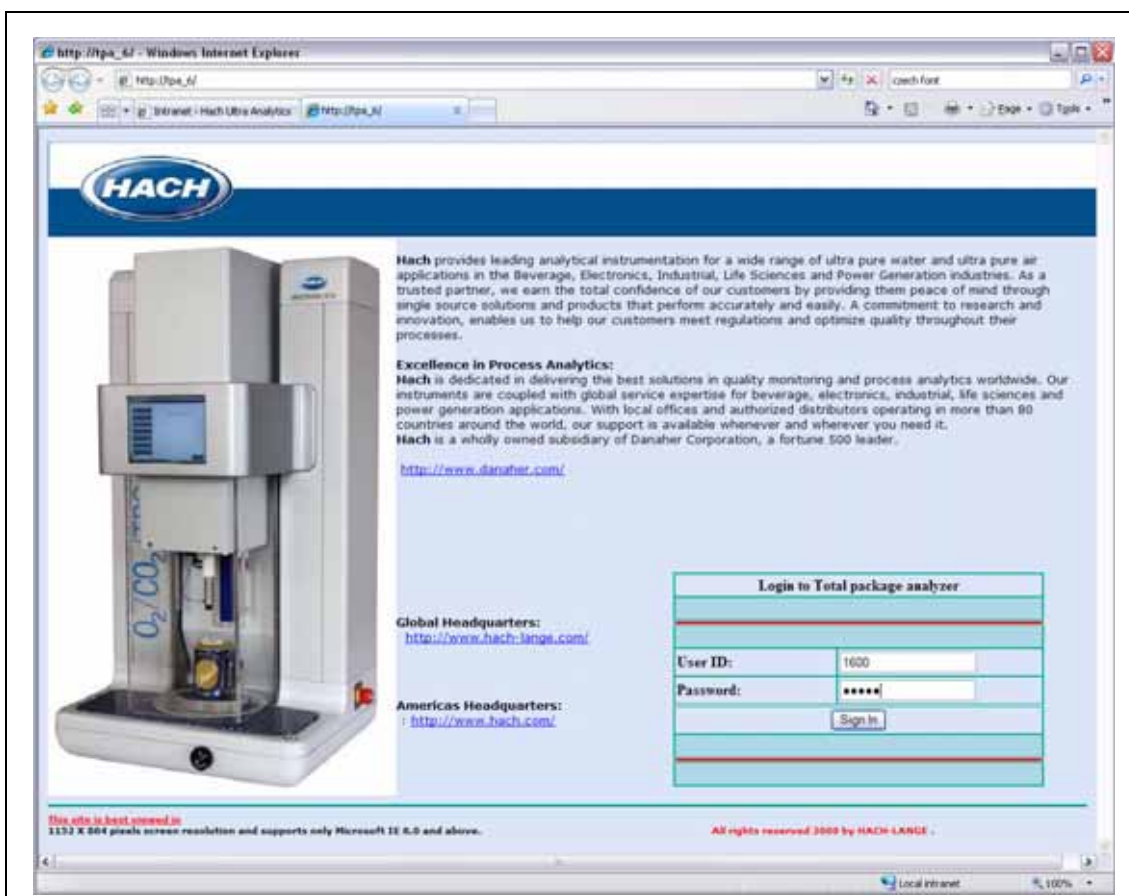


5.6.2 Web browser configuration



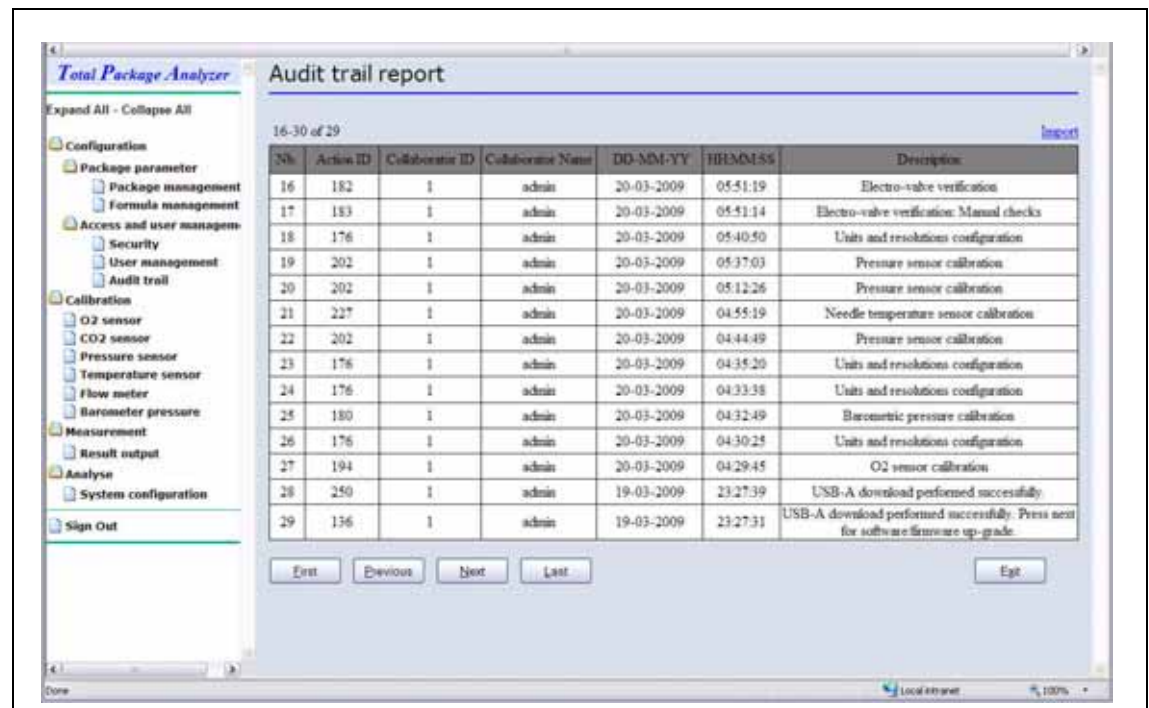
This option allows you to set up an Ethernet connection to download data or system configuration details from the instrument directly to a web page that can be accessed from a PC. To be able to use this option, the instrument must be connected to the network.

Access the information by launching an internet browser on your PC and typing "http://" followed by the device name assigned to the instrument (see screen above). The home page will then be displayed:



You will be required to enter a valid username and password combination (as defined in [User management on page 44](#)).

The initial screen will then be displayed. You can then click on **Expand All** to see all the available options. Then click on the report you wish to view (as in **Audit trail** below).



Depending on the option selected, you will have the possibility to browse through all pages of the reports, by clicking on the **First**, **Previous**, **Next** and **Last** buttons at the bottom. Click on **Exit** to select another report or click directly on the list of reports on the left.

To download the data for your selected option, right click on **Import** (top right of the screen) and select **Save Target As**.



Then selected a location on your PC to store the file.

The files and filenames are the text files that are listed in [Data download configuration on page 46](#).

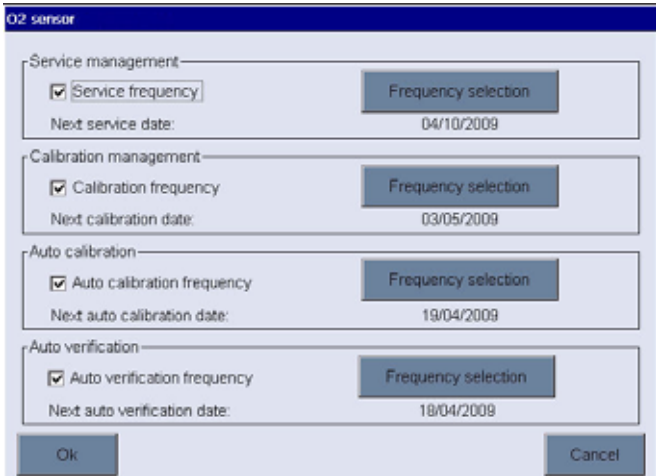
5.7 Sensor configuration

This option defines the sensor service and calibration schedule for all the sensors installed on the instrument. Depending on the sensor selected, it is also possible to define automatic calibration and verification frequencies.

Select from the following sensors:

- O2 sensor
- CO2 sensor
- Pressure sensor
- Temperature sensor
- Flow sensor
- Barometric pressure sensor

The following example is for the O₂ sensor, which illustrates all the available settings:



The screenshot shows a dialog box titled "O2 sensor" with four sections: Service management, Calibration management, Auto calibration, and Auto verification. Each section has a checked checkbox, a "Frequency selection" button, and a "Next" date field. The "Service management" section shows "Next service date: 04/10/2009". The "Calibration management" section shows "Next calibration date: 03/05/2009". The "Auto calibration" section shows "Next auto calibration date: 19/04/2009". The "Auto verification" section shows "Next auto verification date: 18/04/2009". At the bottom are "Ok" and "Cancel" buttons.

Section	Activation Flag	Frequency Selection	Next Date
Service management	<input checked="" type="checkbox"/> Service frequency	Frequency selection	04/10/2009
Calibration management	<input checked="" type="checkbox"/> Calibration frequency	Frequency selection	03/05/2009
Auto calibration	<input checked="" type="checkbox"/> Auto calibration frequency	Frequency selection	19/04/2009
Auto verification	<input checked="" type="checkbox"/> Auto verification frequency	Frequency selection	18/04/2009

Check the activation flags as required:

- Service frequency: When set, the system will inform you when a sensor service is required by setting the LED indicator on the top right of the header banner to yellow.
- Calibration frequency: When set, the system will inform you when a sensor calibration is required by setting the LED indicator on the top right of the header banner to yellow.
- Auto calibration: When set, the system will automatically perform a sensor calibration on the defined date and time (see also note below). The LED indicator on the top right of the header banner will turn red if the calibration failed for any reason.
- Auto verification: When set, the system will automatically perform a sensor verification on the defined date and time (see also note below). The LED indicator on the top right of the header banner will turn red if the verification failed for any reason.

Important Note: Both the auto calibration and auto verification processes will **only** be started when the system is in standby mode. Standby mode can be triggered manually by the user or after an automated system log off.

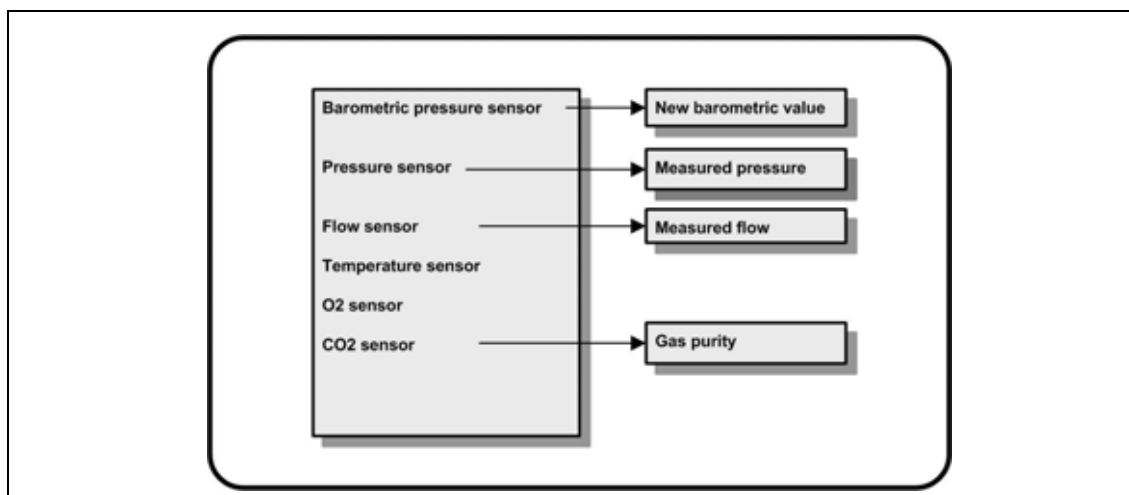
Press the **Frequency selection** button to set the desired frequency:

- Choose between **Weekly**, **Monthly** or **Yearly** by pressing the appropriate radio button
- With the **Weekly** option, define the day of the week when the operation will take place
- With the **Monthly** option, define:
 - The date and monthly interval (e.g. every 15th day, every 3 months), or
 - The day and monthly interval (e.g. every 1st Sunday, every 2 months)
- With the **Yearly** option, define:
 - The date and month (e.g. every 1st February), or
 - The day and month (e.g. every 2nd Saturday of July)

Note: With the automatic calibration and verification options, in addition to the date parameters you will also need to define an idle time in minutes. The operation will then only start when the instrument has been idle for that period of time.

Section 6 Calibration

6.1 Calibration menu overview



This section describes the sequence of actions required to calibrate the sensors and flow meter on the instrument:

- Barometric pressure sensor
- Pressure sensor
- Flow sensor
- Temperature sensor
- O2 sensor
- CO2 sensor

6.2 Standards requirements

Although the instrument includes reliable and accurate automatic sensor calibration and verification routines (refer to [Sensor configuration on page 50](#)), it is recommended that once a year calibrations should be made with external certified standards.

The instrument will provide accurate results provided accurate reference standards are used. The following table shows the maximum ranges for the standards. These ranges should not be exceeded.

Standard	Range
Pressure	± 0.02 bar
Barometric pressure	± 2 mbar
Temperature	$\pm 0.2^{\circ}\text{C}$
CO ₂ sensor	CO ₂ at 99.9% purity at $\pm 0.1\%$ which is the purge gas for the normal operation CO ₂ at 80 - 95% purity at $\pm 0.1\%$ CO ₂ at 80% + 20% N ₂ purity at $\pm 0.1\%$ for nitrogenated beer analysis

6.3 Calibration schedule

This following table shows the recommended sensor calibration intervals (using the instrument's automatic calibration feature) based on an average of 500 package analyses per week. This proposed schedule can be modified according to operating conditions.

Sensor	Interval
Barometric pressure sensor	6 months
Flow meter	6 months
Temperature sensor	6 months
O ₂ sensor	1 month
CO ₂ sensor	6 months
Pressure sensor	6 months

6.4 Barometric pressure sensor

After selecting this option, the details of the last barometric pressure sensor calibration are displayed. This shows the values recorded, and information about who performed the last calibration and when. The due date of the next calibration is also shown (determined by the parameters entered in [Sensor configuration on page 50](#)).

There is the option of starting a new calibration or viewing the last 10 barometric pressure sensor calibration reports (see [Calibration reports on page 62](#)).

The screenshot shows a software interface titled "Barometric pressure sensor". It contains two buttons at the top: "New calibration" and "Calibration reports". Below these is a section labeled "Current value" which displays the following data:

Offset coefficient:	2.87	kPa
Deviation last calibration:	2.81	mbar
Stability:	0.07	%
Temperature:	19.30	°C

Below this is another section displaying user and calibration information:

User name:	Jones
User ID:	1004
Calibration date:	17-04-09 - 08:36:00 AM
Calibration due date:	24/04/2009

An "Exit" button is located at the bottom right of the screen.

1. Start a new calibration by pressing the **New calibration** button. A calibration screen is displayed, with the top box showing the current barometric pressure as measured by the instrument.

The screenshot shows a software interface titled "Barometric pressure sensor calibration". It is divided into two main sections: "Measured values" and "Calibration information".

The "Measured values" section contains the following data:

Current barometric pressure:	957.96	mbar
Deviation last calibration:	-0.07	mbar
Stability:	0.02	%
Temperature:	23.74	°C
New barometric value:	957.89	mbar

The "Calibration information" section contains the following data:

User name:	Jones
User ID:	1004
Calibration date:	17-04-2009 - 08:38:06 AM

At the bottom of the screen are two buttons: "Validation" and "Cancel".

2. Using a precision certified barometer, measure the barometric pressure in the location where the instrument is used and compare the values. If values are the same press **Cancel**, otherwise enter the new barometric value in the lower box and press **Validation** to store the new setting.
3. Once the calibration is completed a calibration report is created.

6.5 Pressure sensor

After selecting this option, the details of the last pressure sensor calibration are displayed. This shows the values recorded, and information about who performed the last calibration and when. The due date of the next calibration is also shown (determined by the parameters entered in [Sensor configuration on page 50](#)).

There is the option of starting a new calibration or viewing the last 10 pressure sensor calibration reports (see [Calibration reports on page 62](#)).

Important Note: This procedure uses information from the barometric pressure sensor. Be sure that this parameter is reliable (i.e. a recent barometric pressure sensor calibration has been performed - see [Barometric pressure sensor on page 54](#)).

The screenshot shows a window titled "Pressure sensor". It has two buttons at the top: "New calibration" and "Calibration reports". Below these is a section titled "Last calibration value" containing a table of calibration data:

Slope:	2430.462	mbar/volt
Offset:	70.085	mbar
Pressure 1:	961.90	mbar
Stability meas 1:	0.001	%
Pressure 2:	4490.00	mbar
Stability meas 2:	0.000	%

Below the table is another section with user and date information:

User name:	Jones
User ID:	1004
Calibration date:	20-04-09 - 10:15:00 AM
Calibration due date:	00-00-00

An "Exit" button is located at the bottom right of the window.

1. Start a new calibration by pressing the **New calibration** button. A calibration screen is displayed and the **One and first point calibration** starts automatically. By default, the first point calibration option uses the **Barometric connection** (button highlighted at top right of the screen). This can be switched to **Forcing gas connection** if required by pressing on the highlighted button.
2. When the measurement stabilizes, the **Validation** button is highlighted. Press this to accept the measurement, or override the current value by entering a value into the **Measured pressure** box and press **Validation**.

The screenshot shows a window titled "Pressure sensor calibration". It has a section titled "First pressure measurement" with three input fields: "Current read pressure" (1059.07 mbar), "Barometric pressure" (962.92 mbar), and "Stability" (0.00). To the right of these fields is a button labeled "Barometric connection". Below these fields is a "Measured pressure" input field (962.94) and a "Validation" button. At the bottom is a "Calibration information" section with three input fields: "User name:" (Jones), "User ID:" (1004), and "Calibration date:" (20-04-2009 - 10:17:18 AM). Below this section are two radio buttons: "One and first point calibration" (selected) and "Second point for two points calibration". A "Cancel" button is at the bottom right.

3. A second **Validation** button will be highlighted at the bottom left of the screen. If only a one point calibration is required, press this second **Validation** button to accept the calibration and complete the process.
4. If a two point calibration is required select the **Second Point for two points calibration** button at the bottom of the screen.

Pressure sensor calibration

Second pressure measurement

Current read pressure: 5131.90 mbar

Barometric pressure: 989.59 mbar

Stability: 0.00

Measured pressure: 4620.06 mbar

Forcing gas connection

Validation

Calibration information

User name: Jones

User ID: 1004

Calibration date: 20-04-2008 - 10:17:16 AM

☐ One and first point calibration ☒ Second point for two points calibration

Cancel

5. By default, the second point calibration option uses the **Forcing gas connection** (button highlighted at top right of the screen). When the measurement stabilizes, the **Validation** button is highlighted.
6. Attach a certified precision barometer to the gas outlet tube on the lower right side of the instrument (as indicated by **Gas connection OUT** in [Figure 4 on page 16](#)) and take the pressure reading. If this value is different from the measurement displayed on screen, enter this pressure reading in the **Measured pressure** box and press **Validation** or if the values are the same, just press **Validation**.
7. Finally press the **Validation** button at the bottom of the screen to accept the new calibration and complete the process.
8. Once the calibration is completed a calibration report is created.

6.6 Flow sensor

After selecting this option, the details of the last flow sensor calibration are displayed. This shows the values recorded, and information about who performed the last calibration and when. The due date of the next calibration is also shown (determined by the parameters entered in [Sensor configuration on page 50](#)).

There is the option of starting a new calibration, verifying the flow sensor or viewing the last 10 flow sensor calibration reports (see [Calibration reports on page 62](#)).

Important Note: This procedure uses information from the pressure sensor. Be sure that this parameter is reliable (i.e. a recent pressure sensor calibration has been performed - see [Pressure sensor on page 55](#)).

Flow sensor

New calibration Verification Calibration reports

Last calibration value

Coefficient A:	0.943
Coefficient B:	-0.494
Coefficient C:	-0.057
Measurement 1 stability:	0.000 %
Measurement 2 stability:	0.000 %
Measurement 3 stability:	0.000 %

User name: Jones
 User ID: 1004
 Calibration date: 20-04-09 - 10:15:00 AM
 Calibration due date: 00-00-00

Exit

New calibration:

1. Start a new calibration by pressing the **New calibration** button. A calibration screen is displayed.
2. The instrument will then compute the measured flow in four steps (at 0.200 ml/s, 0.400 ml/s, 0.800 ml/s and at 0.000 ml/s). The results are displayed on screen.

Flow sensor calibration

Current values

Pressure: 2818.51 mbar Elapsed time: 4.01 Second
 Temperature: 29.2 °C

Measured values

	Delta P. mbar	Delta t. Second	Computed flow ml/s
Step 1 0.200 ml/s	1475.68	84.18	0.389
Step 2 0.400 ml/s	1440.08	46.60	0.651
Step 3 0.800 ml/s	1486.36	25.02	1.251
Step 4 0.000 ml/s	0.00	0.00	0.000

Validation Cancel

3. After a few minutes, when the process is complete, the **Validation** button is highlighted. Press this button to accept the calibration (you will need to confirm acceptance).
4. Once the calibration has completed a calibration report is created.

Verification:

1. The process is exactly the same as for a new calibration, but once the details have been displayed on screen press the **Cancel** button to complete the process. No report is produced.

6.7 Temperature sensor

After selecting this option, the details of the last temperature sensor calibration are displayed. This shows the values recorded, and information about who performed the last calibration and when. The due date of the next calibration is also shown (determined by the parameters entered in [Sensor configuration on page 50](#)).

There is the option of starting a new calibration or viewing the last 10 temperature sensor calibration reports (see [Calibration reports on page 62](#)).

The temperature calibration is made using an accurate internal resistor.

The screenshot shows a software interface titled "Temperature sensor". It has two buttons at the top: "New calibration" and "Calibration reports". Below these is a section titled "Last calibration value" containing a table of calibration data. At the bottom, there is a section for user and date information, and an "Exit" button.

Last calibration value		
Offset coefficient:	0.102	°C
Slope coefficient:	1.012	
Resistance 1 temperature:	24.61	°C
Stability:	0.0	°C
Resistance 2 temperature:	0.39	°C
Stability:	0.0	°C

User name:	Jones
User ID:	1004
Calibration date:	20-04-09 - 01:24:00 PM
Calibration due date:	24/04/2009

1. Start a new calibration by pressing the **New calibration** button. A calibration screen is displayed.

The screenshot shows a software interface titled "Temperature sensor calibration". It has two main sections: "Measured values" and "Calibration information". The "Measured values" section contains input fields for Temperature 1, Stability, Temperature 2, and Stability. The "Calibration information" section contains input fields for User name, User ID, and Calibration date. At the bottom, there are "Validation" and "Cancel" buttons.

Measured values	
Temperature 1:	24.61 °C
Stability:	0.02 °C
Temperature 2:	0.39 °C
Stability:	0.00 °C

Calibration information	
User name:	Jones
User ID:	1004
Calibration date:	20-04-2009 - 01:38:53 PM

2. The instrument measures two temperature values and checks the stability of the measurements. Provided the measurements are stable, you can choose to accept or reject the new values. Press **Validation** to store the new setting.
3. Once the calibration is completed a calibration report is created.

6.8 Oxygen sensor

After selecting this option, the details of the last oxygen sensor calibration are displayed. This shows the values recorded, and information about who performed the last calibration and when. The due date of the next calibration is also shown (determined by the parameters entered in [Sensor configuration on page 50](#)).

There is the option of starting a new calibration or viewing the last 10 oxygen calibration reports (see [Calibration reports on page 62](#)).

Important Note: This procedure uses information from the barometric pressure sensor. Be sure that this parameter is reliable (i.e. a recent barometric pressure sensor calibration has been performed - see [Barometric pressure sensor on page 54](#)).

The screenshot shows a software window titled "O2 sensor". At the top, there are three buttons: "New calibration", "Verification", and "Calibration reports". Below these buttons, the window displays the "Last calibration value" section, which contains the following data:

Calibration coefficient:	111.924	µA/bar
Ratio Ideal membrane:	94.791	%
Ratio last calibration:	94.791	%
Stability:	0.25	%
Temperature:	28.17	°C
Barometric pressure:	981.88	mbar

Below this table, there is another section for user and date information:

User name:	Jones
User ID:	1004
Calibration date:	24-04-09 - 01:24:00 PM
Calibration due date:	24/09/2009

An "Exit" button is located at the bottom right of the window.

The O₂ sensor should be calibrated after each sensor service or when the calibration due date parameter has been passed. After a sensor service, wait at least 30 minutes after mounting a new membrane before calibrating.

Note: For full details on sensor servicing, please refer to the **A1100 Sensor Installation and Maintenance Manual** that was delivered with the instrument.

The O₂ sensor is calibrated in-situ with an air pump providing a continuous flow of fresh air in front of the sensor head. The recommended minimum calibration time is 20-30 minutes.

New calibration:

1. Start a new calibration by pressing the **New calibration** button. A calibration screen is displayed.

The screenshot shows a software window titled "O2 sensor calibration". It is divided into two main sections: "Measured values" and "Calibration information".

Measured values:

Slope coefficient:	75.320	µA/bar
Ratio Ideal membrane	57.081	%
Ratio last calibration	100.039	%
Stability	0.002	%
Current	14.493	µA
Temperature	24.64	°C
Barometric pressure	943.9	mbar

Calibration information:

User name:	Jones
User ID:	1004
Calibration date:	29-04-2009 - 07:19:10
Calibration Status:	Ratio within range

At the bottom of the window, there are two buttons: "Validation" and "Cancel".

2. The value “Ratio ideal membrane” is a percentage of the current against the ideal current for the membrane being used. If this percentage is not within the accepted range, an error message is displayed and the calibration process fails. A warning message will be displayed when this value is close to the boundaries, but when calibration can be accepted.
3. The value “Ratio last calibration” shows the percentage of this measurement and the last sensor calibration measurement. The “Stability” field shows the stability of the measurements.
4. The **Calibration Status** box at the bottom of the screen shows whether the calibration is valid or not. Only if valid and with stable measurements will the **Validation** button be displayed. Pressing this button will allow you to accept the calibration, store the new values, and write the details to the calibration report file.

Note: Remember it is recommended to leave the calibration running for 20-30 minutes before accepting the calibration.

5. If the calibration cannot be performed, an error message will be displayed giving the reason.

Verification:

1. The process is exactly the same as for a new calibration, but once the details have been displayed on screen press the **Cancel** button to complete the process. No report is produced.

6.9 Carbon dioxide sensor

After selecting this option, the details of the last carbon dioxide sensor calibration are displayed. This shows the values recorded, and information about who performed the last calibration and when. The due date of the next calibration is also shown (determined by the parameters entered in [Sensor configuration on page 50](#)).

There is the option of starting a new calibration or viewing the last 10 carbon dioxide calibration reports (see [Calibration reports on page 62](#)).

The screenshot shows a software window titled "CO2 sensor". At the top, there are three buttons: "New calibration", "Verification", and "Calibration reports". Below these buttons is a section titled "Last calibration value" which contains a table of calibration data. At the bottom of the window, there is a section for user and date information, and an "Exit" button.

Last calibration value		
Offset coefficient:	25.121	%
Slope coefficient:	0.941	
Calibration gas 1 purity:	99.900	%
Calibration gas 2 purity:	95.000	%
Gas 1 Measurement stability:	0.000	%
Gas 2 Measurement stability:	0.000	%
Flow:	1.004	ml/s
Temperature:	19.82	°C

User name:	Jones
User ID:	1004
Calibration date:	24-04-09 - 01:24:00 PM
Calibration due date:	24/06/2009

Exit

The CO₂ sensor needs to be calibrated approximately once every 3 months and is calibrated using near pure CO₂ (purity > 99.5%) which may already be supplied as the forcing and purge gas.

You can also perform a two point calibration using a second supply of gas that has a known, but lower, concentration of CO₂ (e.g. purity of 95%). Perform the calibration as follows:

One point calibration

1. Start a new calibration by pressing the **New calibration** button. A calibration screen is displayed showing the latest gas purity data of the main gas. The **Main gas** radio button will be highlighted at the bottom of the screen.

The screenshot shows the 'CO2 sensor calibration' window. It has two main sections: 'TC first calibration gas' and 'Calibration information'. In the 'TC first calibration gas' section, there are input fields for 'Gas read purity' (99.68 %), 'Gas flow' (1.00 ml/s), 'Stability' (0.10 %), and 'Gas purity' (99.90 %). A 'Validation' button is to the right of the 'Gas purity' field. In the 'Calibration information' section, there are fields for 'User name' (Jones), 'User ID' (1004), and 'Calibration date' (29-04-2009 - 07:23:42). At the bottom, there are two radio buttons: 'Main gas' (which is selected with a black dot) and 'Second calibration gas'. A 'Cancel' button is at the bottom right.

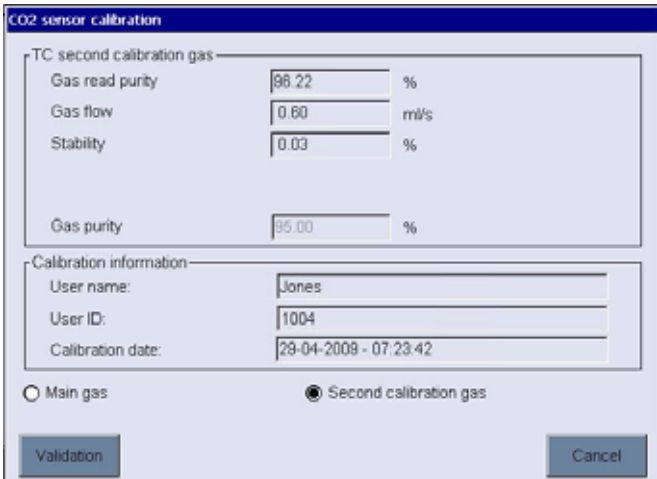
2. If the value of the gas purity for the main gas is incorrect, enter the correct value in the **Gas purity** box.
3. Press the **Validation** button. A message will be displayed warning you that this is a one point calibration.

This screenshot shows the same 'CO2 sensor calibration' window, but with updated values: 'Gas read purity' is 99.23 %, 'Gas flow' is 1.002 ml/s, and 'Stability' is 0.03 %. The 'Gas purity' field still shows 99.90 %. A yellow warning triangle icon is displayed next to the text 'One value calibration enabled'. The 'Main gas' radio button remains selected. The 'Validation' button is now visible at the bottom left, and the 'Cancel' button is at the bottom right.

4. Press the **Validation** button at the bottom of the screen to accept the new calibration. Once the calibration has completed a calibration report is created.

Two point calibration

1. Proceed as for a one point calibration (steps 1 to 3 above).
2. Do **not** press the **Validation** button at the bottom of the screen, but select the **Second calibration gas** radio button and attach a supply of known CO₂ gas to the instrument (as indicated by **Gas connection IN 3** in [Figure 4 on page 16](#)).
3. Enter the known concentration value in the **Gas purity** box.
4. Press the **Validation** button at the bottom of the screen to accept the new calibration.



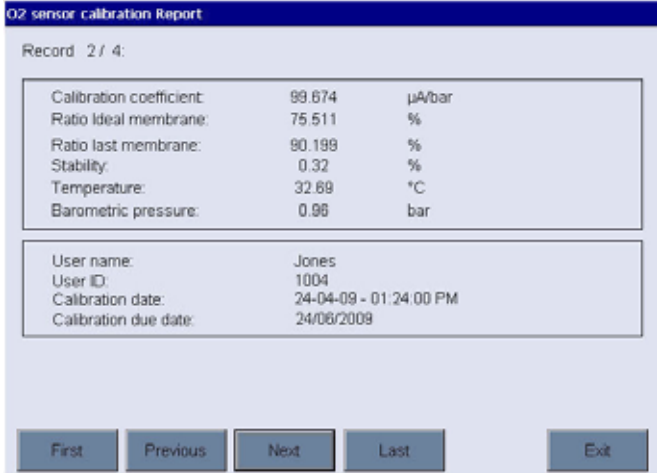
The screenshot shows the 'CO2 sensor calibration' window. It has two main sections: 'TC second calibration gas' and 'Calibration information'. The first section contains input fields for 'Gas read purity' (96.22 %), 'Gas flow' (0.60 mL/s), 'Stability' (0.03 %), and 'Gas purity' (95.00 %). The second section contains 'User name' (Jones), 'User ID' (1004), and 'Calibration date' (29-04-2009 - 07:23:42). At the bottom, there are two radio buttons: 'Main gas' (unselected) and 'Second calibration gas' (selected). There are also 'Validation' and 'Cancel' buttons.

5. Press the **Validation** button to accept the calibration, store the new values, and write the details to the calibration report file. If the calibration cannot be performed, an error message will be displayed giving the reason.

Verification:

1. The process is exactly the same as for a new calibration, but once the details have been displayed on screen press the **Cancel** button to complete the process. No report is produced.

6.10 Calibration reports



The screenshot shows the 'O2 sensor calibration Report' window. It displays 'Record 2 / 4:'. The main data is presented in a table:

Calibration coefficient:	99.674	µA/bar
Ratio Ideal membrane:	75.511	%
Ratio last membrane:	90.199	%
Stability:	0.32	%
Temperature:	32.69	°C
Barometric pressure:	0.96	bar

Below the table, there is a section for user and date information:

User name:	Jones
User ID:	1004
Calibration date:	24-04-09 - 01:24:00 PM
Calibration due date:	24/06/2009

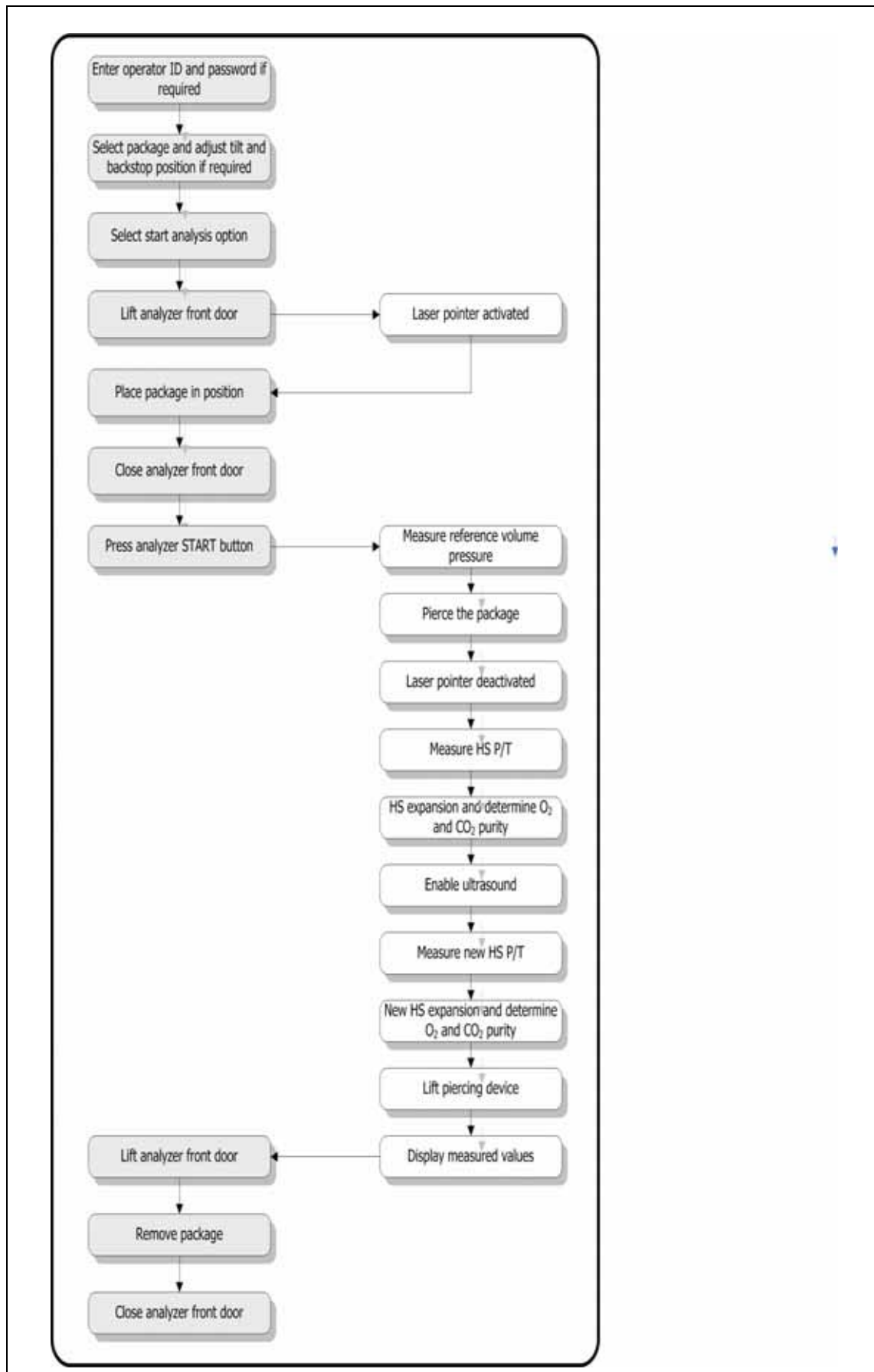
At the bottom, there are five buttons: 'First', 'Previous', 'Next', 'Last', and 'Exit'.

Details of the last 10 calibrations of the selected sensor are displayed on screen. Use the **First**, **Previous**, **Next** and **Last** buttons to scroll through all existing reports.

Note: The calibration reports can be easily transferred to a PC or USB storage device (see details in the section entitled [Communication on page 46](#)).

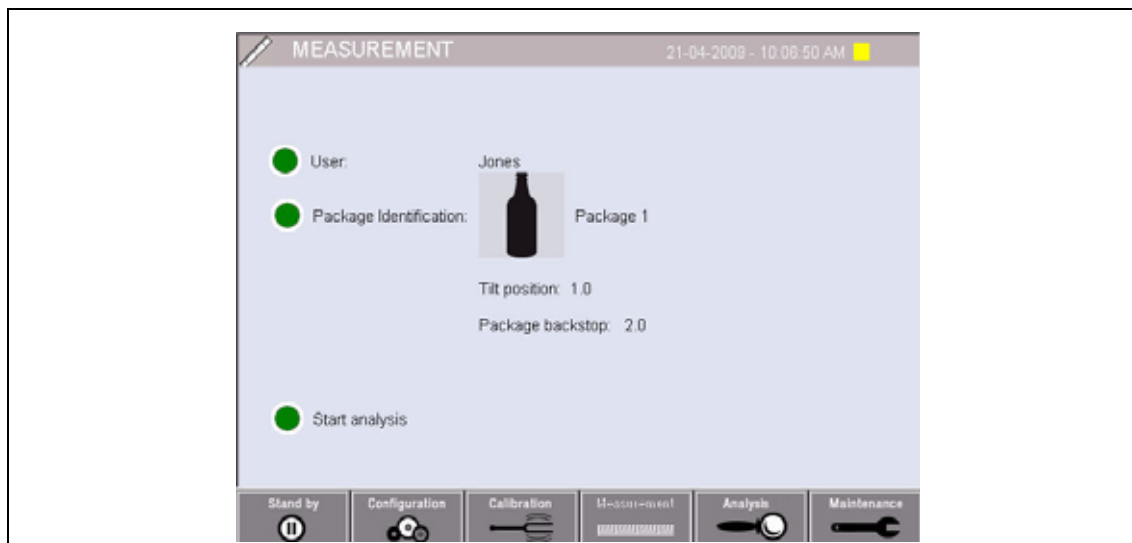
Section 7 Measurement

The following flow chart shows an overview of the measurement process. The actions listed on the left are performed by the user, and those on the right by the instrument.



7.1 Main screen

The initial screen displays standard information about the package to measure:



You have the option to change the details displayed or to start the measurement process:

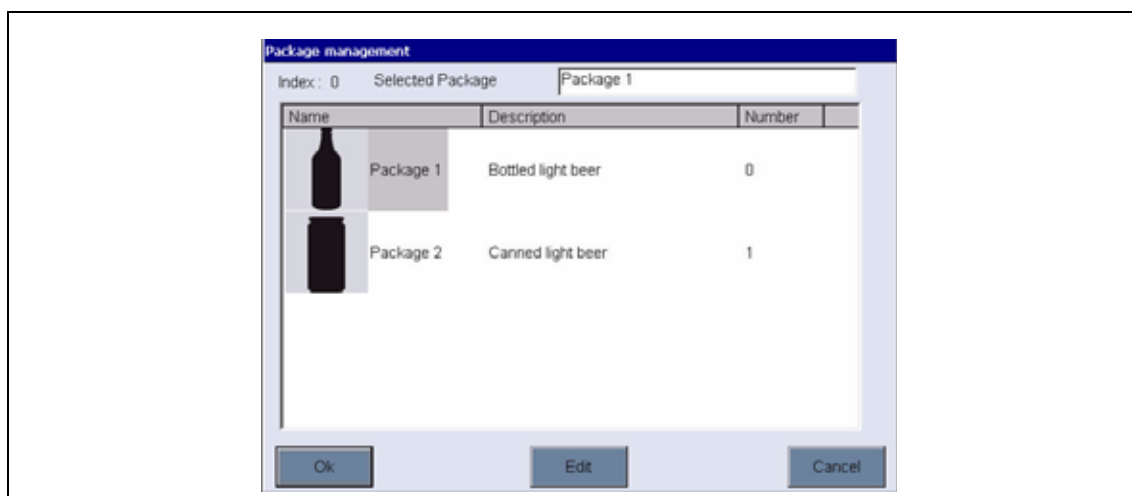
- Operator
- Package ID
- Start analysis

7.1.1 Operator

Provided access to the instrument is by a valid ID and password combination, the operator name will be displayed. This will be blank if security access is disabled.

7.1.2 Package ID

Define the package to be measured. The package details must have already been entered into the system (see [Package parameters on page 37](#) for details).



Select the package from the list provided and press **Ok**. If necessary, you can change the package details using the **Edit** button. For details on editing a package, refer to [Package parameters on page 37](#)).

7.1.3 Start analysis

Important Note: Once a sample has completed the measurement process it will contain a small amount of antifoam. Therefore, after measurement, ensure the sample is disposed of in a sink (or similar) to avoid any risk of ingestion.

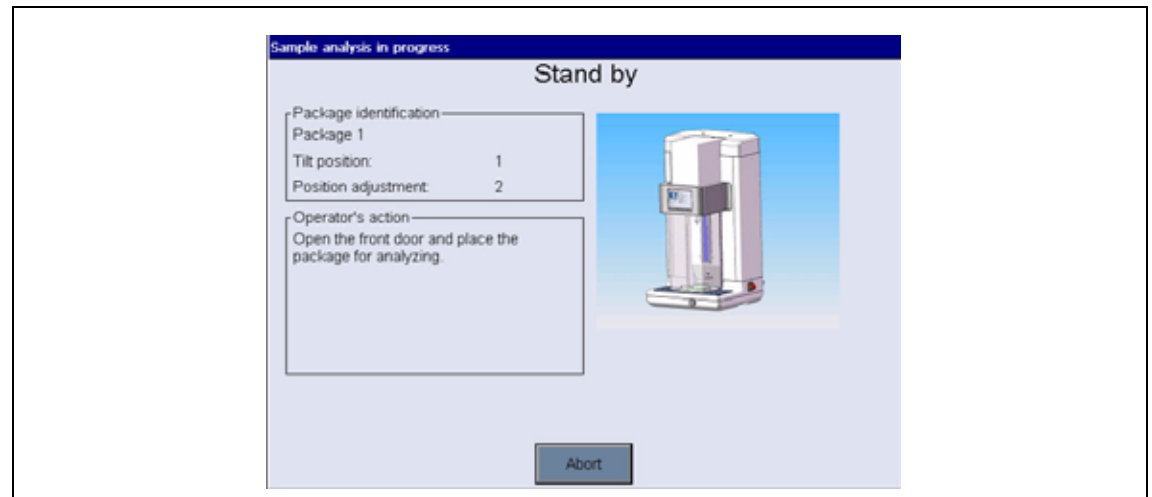
Once the **Start Analysis** option is selected, the instrument will display any operator instructions and progress throughout the duration of the measurement process.

Note: If the Diagnostic measurement view and the Display diagnostics results boxes have been checked during configuration (see [Measurement output on page 41](#)), then the screens will differ (see examples in [Diagnostic measurement and results views on page 68](#)) but the process is the same.

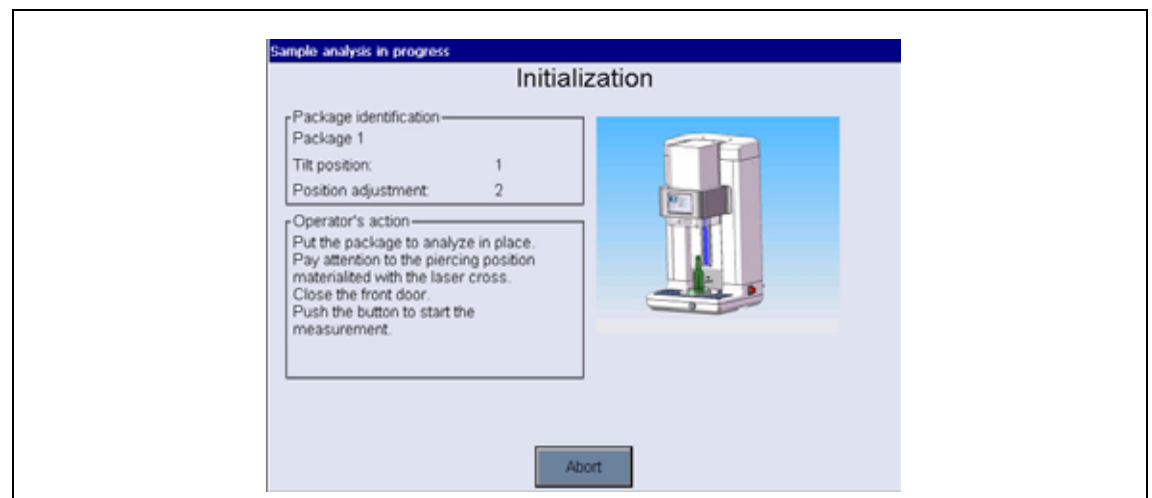
Select this option to start the measurement process. Each screen will give information regarding the measurement step being taken, and will give instructions on any user involvement required.

Note: It is advisable to cover the base of the circular package holder with water for better energy transmission of ultrasound waves to the package content.

The first screen gives details of the package being analyzed and gives the user information on what action to take:



As instructed, raise the transparent front door in order to place the package in the measuring chamber. As soon as the door is raised, the initialization screen is displayed with the next set of instructions:

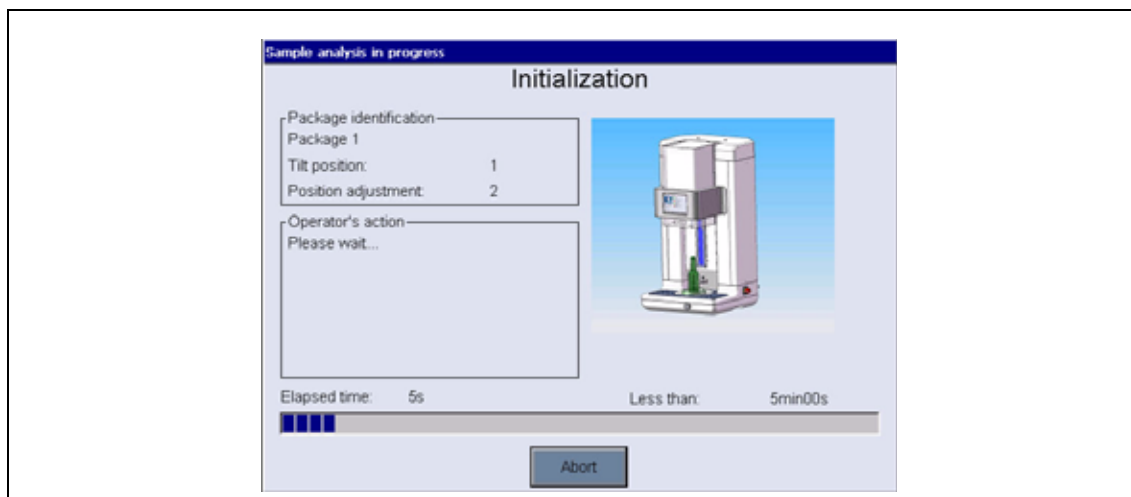


As instructed, place the package to be analyzed on the circular platform, and set the tilt position as defined for this package by turning the black knob on the front. Two red laser beams are activated as the front door is raised. Position the package so that the centre of the package is where the two red beams intersect. This is the place where the package will be pierced.

Make sure that the package is also hard up against the backstop. This may require realigning the backstop by turning the locking wheel counter clockwise and adjusting its position to that defined for this package. Lock it in place by turning the locking wheel clockwise finger tight.

Once the package is secure against the backstop and the piercing position aligned with the two red laser beams, close the front door.

Start the measurement process by pressing the **START** button on the right side of the instrument base.

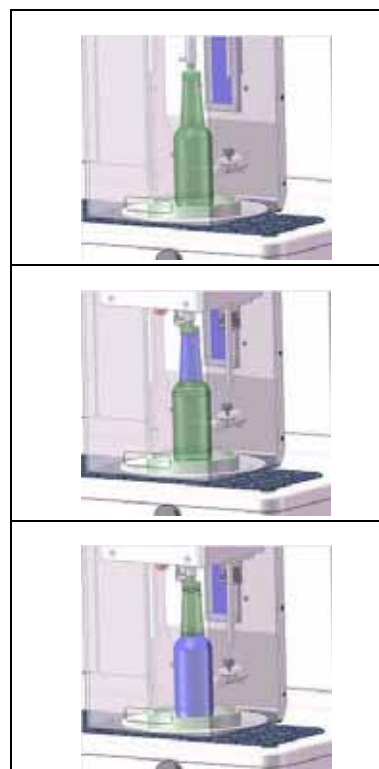


A progress bar is displayed at the bottom of the screen showing the elapsed time to date, and the estimated time for measurement completion. This bar is updated on an on-going basis.

No intervention or action from the user is required until the measurement process has completed. However, you do have the option to **Abort** the process at any point.

The measurement goes through four main stages during which time a number of measurements are taken and calculated:

- The piercing arm is lowered and the package is pierced
- The head space is analyzed
- The liquid is analyzed



- The measurement completes and the piercing arm is raised to its home position



Once measurement is complete, the results are displayed. The three columns of data displayed are those that were previously defined in [Measurement output on page 41](#):

The three measurements are displayed graphically and are color coded. Those in green show that the measurements are within the defined limits for this package. Those in red signify that the measurements are outside the defined limits.

These limits have been previously defined in the alarms section of [Package parameters on page 37](#).

It is possible to add 2 numerical values and 5 comments to these results by entering them in the text boxes displayed down the left.

Press the **Continue** button to return to the main measurement screen, or press the **Info** button to display more detailed results (again color coded) in a tabular format:

Field	Value	Max	Min	Unit
TP O2	0.0	10.0	0.0	mg
O2 Liq	0.0	10.0	0.0	mg
O2 HS	0.0	10.0	0.0	mg
D O2	5.9	10.0	0.0	pptb
Total CO2	1876.7	10.0	0.0	mg
CO2 Liq	1714.0	10.0	0.0	mg
CO2 HS	182.7	10.0	0.0	mg
CO2 P.T.	5.21	10.00	0.00	g/kg
D CO2	5.21	10.00	0.00	g/kg
Liq Vol.	329.0	10.0	0.0	ml
H.S. Vol.	28.0	10.0	0.0	ml
Formula 1	0.0	10.0	0.0	---
Formula 2	0.0	10.0	0.0	---
Formula 3	0.0	10.0	0.0	---
Formula 4	0.0	10.0	0.0	---
Formula 5	0.0	10.0	0.0	---

For additional information on viewing the full set of measurement results, see the section entitled [Open data on page 69](#).

7.2 Diagnostic measurement and results views

These views are essentially used for troubleshooting purposes by Hach Lange service technicians, therefore no detailed explanation of the data displayed is given in this manual.

7.2.1 Measurement view

As the measurement process executes, the measurement details are displayed down the left side of the screen. The first line of the display shows the current stage in the process. The right side of the screen gives additional textual information.

Sample analysis in progress			
7	Liquid analysis		
Flow	0.381	ml/s	The pressure is stable
O2	0.014	mbar	End of the dead volume rinsing
CO2	99.51	%	
Pressure	3348.97	mbar	
Temp. N	18.74	°C	
Z position	322	mm	
P. Barom.	0.964	bar	

Abort

7.2.2 Results view

The following screen is displayed on completion of the measurement process:

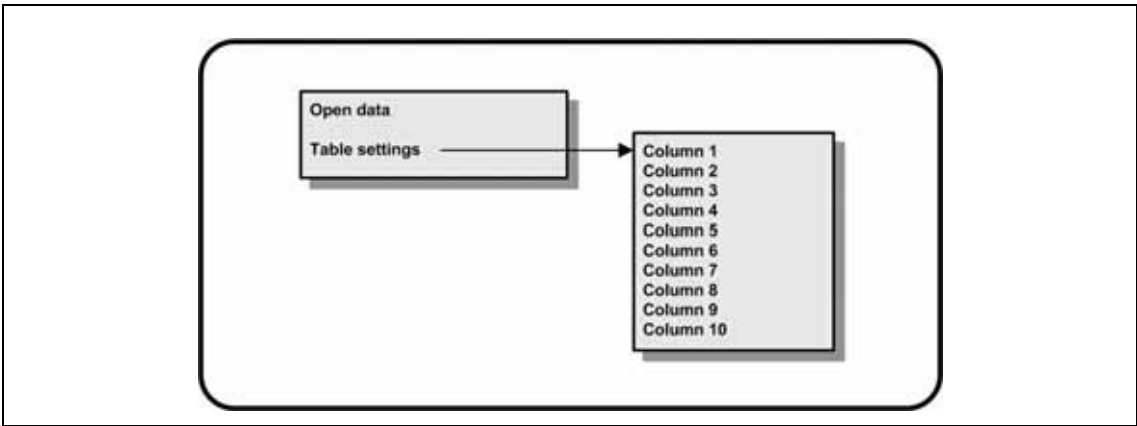
Measurement result			
Head space volume (reference)	27.09	ml	
Head space volume (exhaust)	22.11	ml	
O2 in head space	0.00163	ml	
O2 in Liquid	0.00251	ml	0.014 ppm
Total O2	0.00414	ml	
O2 Phase 1	0.00086	ml	
O2 Phase 2	0.00012	ml	
A/B expo	0.00316	ml	R2 0.00000
P/T CO2	5.91139	g/kg	
True CO2	5.36783	g/kg	
Total CO2	1.71271	g	

Stored measured sensor values ☒ Continue

Note: If the **Stored measured sensor values** box at the bottom of the screen is checked, the values are recorded in the results file (and as raw data) but with pre-defined units. These units cannot be changed by the user.

Section 8 Analysis

8.1 Analyze menu overview

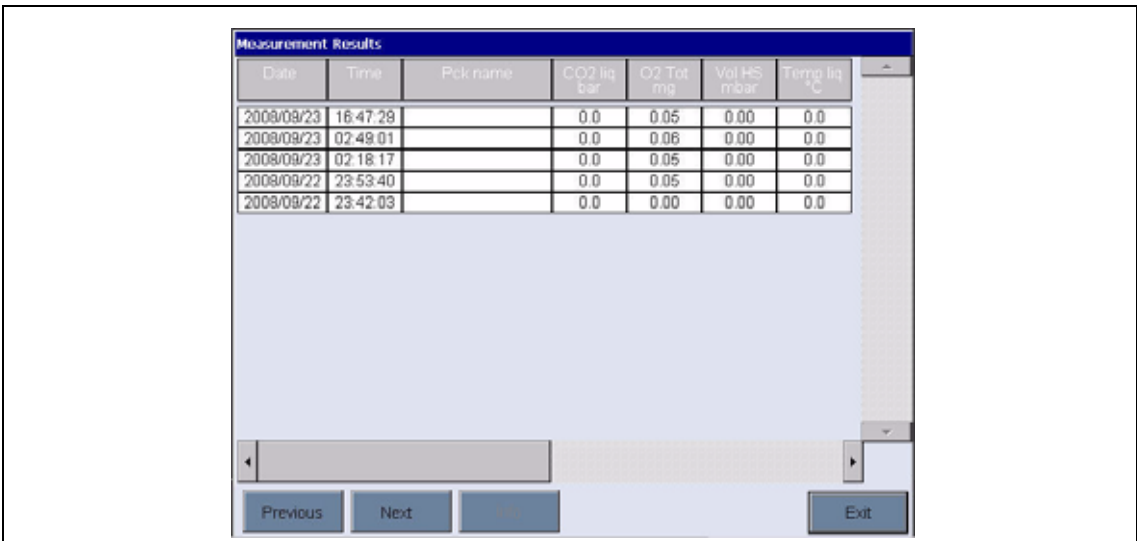


This section describes the options available for viewing the measurement data on the instrument:

- Open data
- Table settings

8.2 Open data

This option allows you to view the measurement data from the last 1000 measurements.



The data elements displayed are those defined in [Table settings on page 70](#). Use the **Previous** and **Next** buttons to scroll through the data. Use the **Exit** button to return to the main analyze menu. Select one of the lines of data and the **Info** button will be made available. Press the **Info** button to see more details of the measurement in a new screen.

8.3 Table settings

This options allows you to define up to 10 data elements that the instrument will display for each measurement. More data is recorded, but only 10 values can be displayed on screen.

Column	Setting
Column 1	Date
Column 2	Time
Column 3	Package name
Column 4	CO2 Liq.
Column 5	O2 Total
Column 6	Vol H5
Column 7	T. liq.
Column 8	Vol liq.
Column 9	Operator name
Column 10	None

Validation Cancel

- Column 1-10: Define for each column the data to view from the drop-down list of available data elements.

Select **Validation** to accept and save the selected data elements.

Section 9 Maintenance

9.1 Maintenance schedule

This following table shows the recommended maintenance schedule for an average of 500 package analyses per week. This proposed schedule should be modified according to operating conditions.

Item	Interval
Clean front protection door	Daily
Gore-Tex filter replacement	3 months
Antifoam cartridge refill	3 months
Piercing gasket replacement	3 months
Piercing tip replacement	6 months
Oxygen sensor maintenance	3 months

There are 4 maintenance wizards available from the maintenance menu that give on-screen instructions on the following maintenance subjects. These functions are also described in detail in this section of the manual:

- Antifoam cartridge replacement - see [Replacing the antifoam cartridge on page 72](#)
- EC sensor maintenance - see [Oxygen sensor maintenance on page 74](#)
- Gore-Tex filter replacement - see [Gore-Tex® filter replacement on page 75](#)
- Piercing gasket and tip replacement - see [Replacing the piercing gasket and tip on page 76](#)

9.2 Instrument

Wipe down the instrument with a damp cloth to keep the exterior clean, and also paying particular attention to the inside of the transparent front door.

9.3 Purge gas cylinder

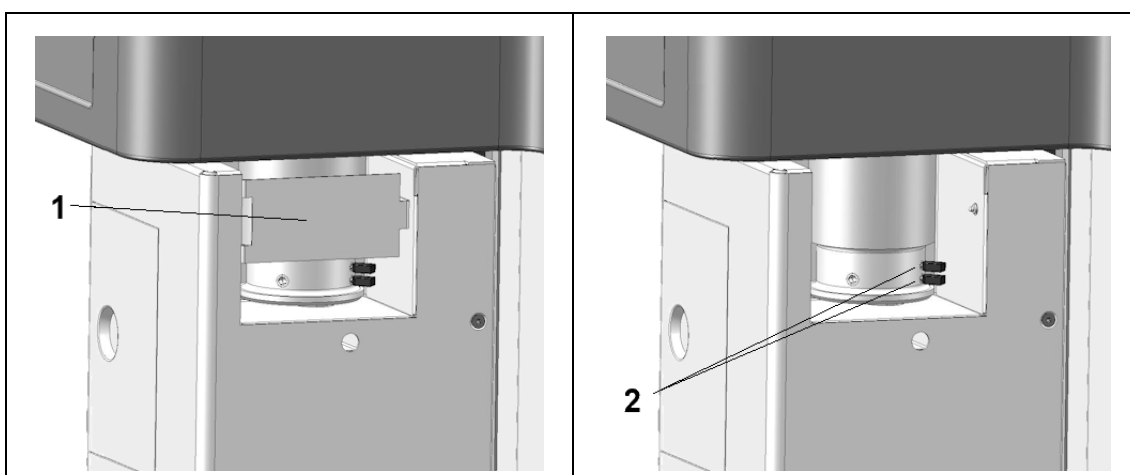
Check the purge gas cylinder daily to ensure there is an adequate supply of gas. On no account should the cylinder become empty while the instrument is switched on.

9.4 Replacing the antifoam cartridge

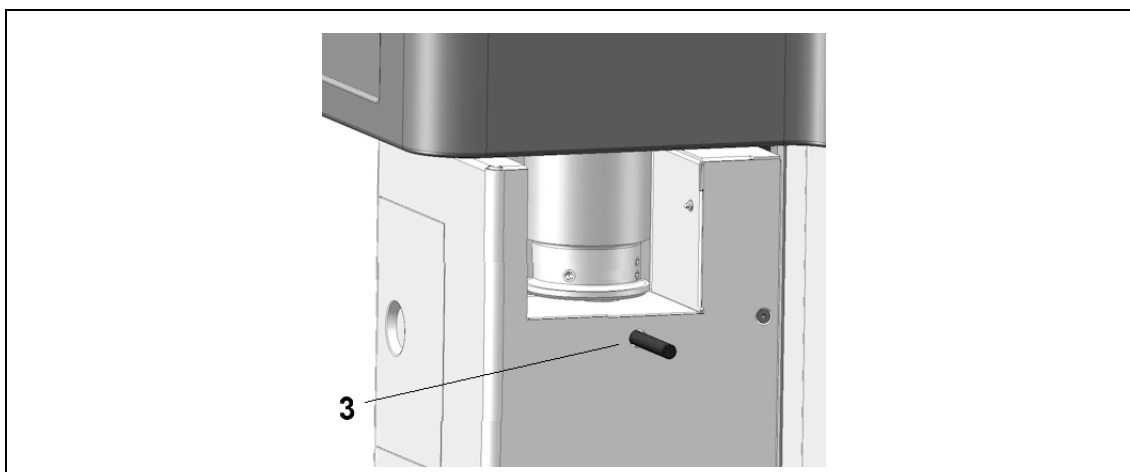
9.4.1 Antifoam cartridge removal

The antifoam cartridge is located inside the measurement head. It will need replacing about once every six months, but you can check the level by using the option [Antifoam system on page 81](#) (part of the [Actuator verification](#) menu on page 79). If the lower level button is highlighted, replace the cartridge as follows:

1. Lower the piercing device to its lowest point (it will stop automatically once this point is reached). If using the wizard, simply press the **Do It** key on screen. If not using the wizard, refer to [Manual displacement on page 80](#) for details.
2. Remove the plastic front protection door by carefully raising it up on its rollers and over the top of the instrument to give access to the antifoam cartridge location.
3. Open and remove the small front door (No. 1 in the diagram) for easy access to the antifoam cartridge chamber. Disconnect the two pump leads (No. 2 in the diagram).



4. With a pen (or similar) push in the latch to release the cartridge (No. 3 in the diagram). Remove the cartridge by raising and rotating it until it is free from its location.



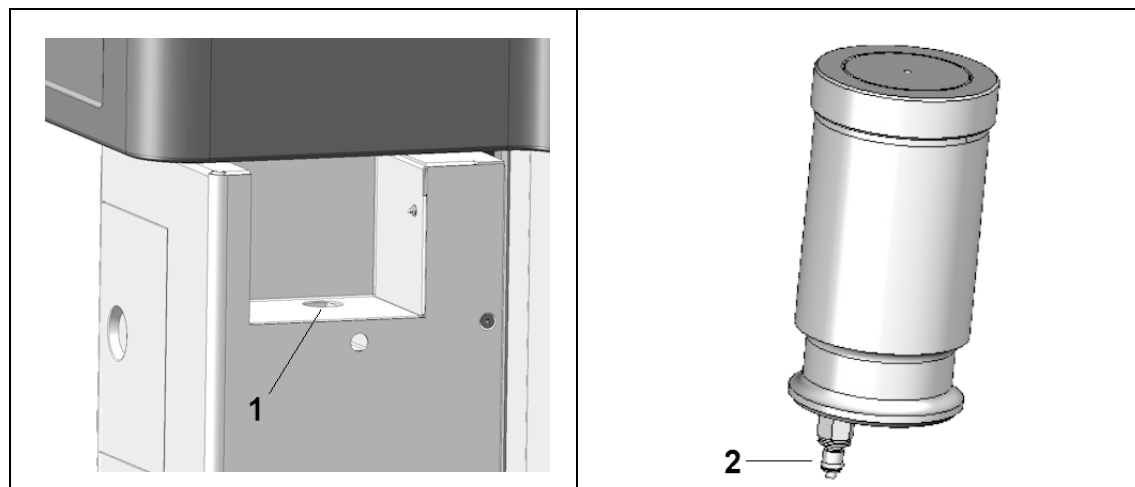
9.4.2 Antifoam cartridge replenishment

A replacement cartridge can be used or the existing cartridge refilled with antifoam. If refilling the existing cartridge, follow the instructions given in [Antifoam cartridge preparation on page 22](#).

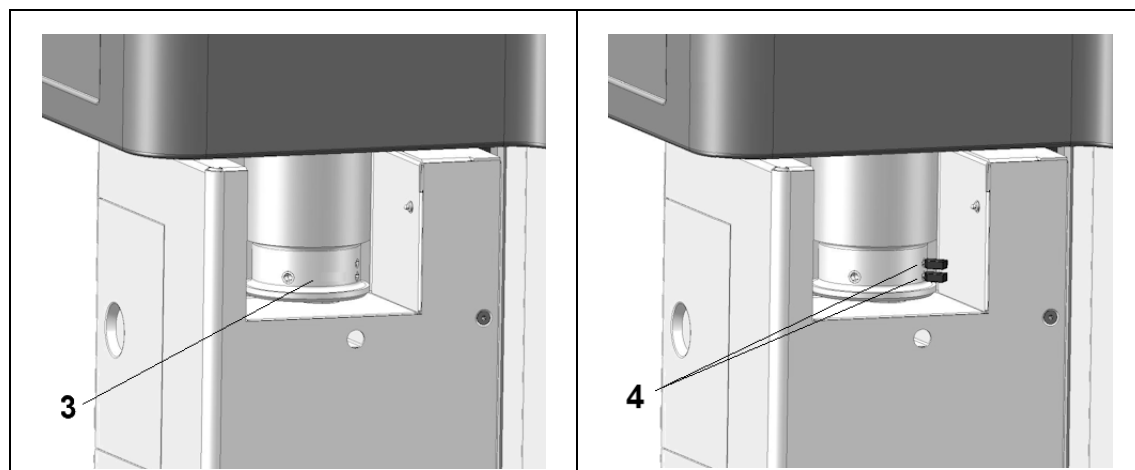
Important Note: To ensure the performance and reliability of the instrument, it is strongly recommended to **only** use the silicon antifoam supplied by Hach Lange (part number 33156).

9.4.3 Antifoam cartridge installation

1. Fit the cartridge back in place by lining up the two fluid connectors (chamber connector shown as No. 1 in the diagram, cartridge connector as No. 2).



2. Press down gently and twist slightly (if necessary) until the cartridge clicks into place (No. 3 in the diagram) with the two connectors located towards the back.



3. Attach the two connectors (No. 4 in the diagram) to the pump leads inside the chamber (no specific polarity).
4. Return the small door to its original location and close to secure the chamber.
5. The plastic front protection door can now be put back in place by lowering it down over the instrument, ensuring the rollers are correctly located inside the slots on each side.

CAUTION

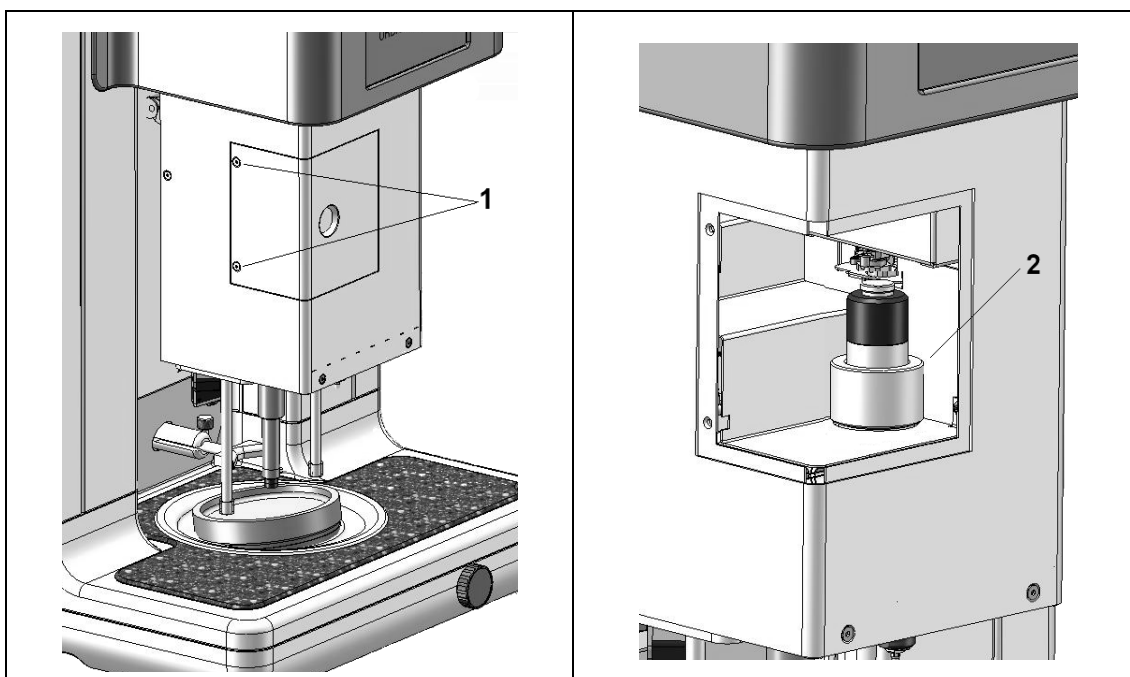
Ensure the rollers are correctly positioned inside the slots before slowly and carefully lowering the door. Incorrect positioning and/or forcing the door down could easily damage the exterior housing of the instrument.

6. Manually raise the piercing device back to its upmost (home) position. Refer to [Home position on page 79](#) if you are unsure how to do this.
7. The antifoam tubing needs to be primed to ensure they are full of the new antifoam. For instructions on doing this, refer to [Prime the antifoam tubing on page 27](#).

9.5 Oxygen sensor maintenance

Wear on the membrane and chemical reactions within the gas sensor requires that the oxygen sensor be serviced regularly to restore its original sensitivity. A clear sign that a sensor maintenance is required is when measurements are noticeably less stable than usual, and when a calibration does not improve the situation.

1. Lower the piercing device to its lowest point (it will stop automatically once this point is reached). If using the wizard, simply press the **Do It** key on screen. If not using the wizard, refer to [Manual displacement on page 80](#) for details.
2. Remove the plastic front protection door by carefully raising it up on its rollers and over the top of the instrument to give access to the antifoam cartridge location.
3. Unscrew the two screws (No. 1 in the diagram) locking the small sensor access panel and remove it to reveal the sensor (No. 2 in the diagram).



4. Disconnect the sensor cable, then unscrew the sensor collar and remove both the collar and sensor from its location.
5. Once the sensor has been removed, it can be easily serviced. For full details on servicing the EC sensor please refer to the accompanying **ORBISPHERE Model A1100 User Manual**.
6. After servicing, insert the sensor back into the sensor socket and secure with the sensor collar finger tight to hold it firmly in place. Connect the sensor cable to the top of the sensor using the standard LEMO-10 plug-in connection, and hand tighten the cable collar.
7. Replace the sensor access panel and secure back in place with the two screws.
8. The plastic front protection door can now be put back in place by lowering it down over the instrument, ensuring the rollers are correctly located inside the slots on each side.

CAUTION

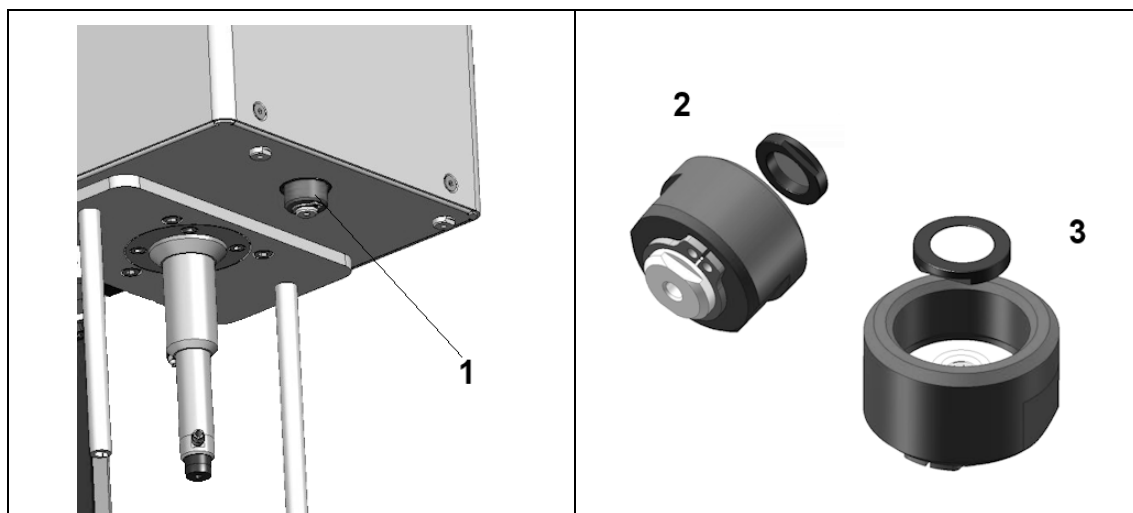
Ensure the rollers are correctly positioned inside the slots before slowly and carefully lowering the door. Incorrect positioning and/or forcing the door down could easily damage the exterior housing of the instrument.

9. Manually raise the piercing device back to its upmost (home) position. Refer to [Home position on page 79](#) if you are unsure how to do this.

9.6 Gore-Tex® filter replacement

The Gore-Tex filter is located under the measurement column and should be replaced every three months.

1. Lower the piercing device to its lowest point (it will stop automatically once this point is reached). If using the wizard, simply press the **Do It** key on screen. If not using the wizard, refer to [Manual displacement on page 80](#) for details.
2. Remove the plastic front protection door by carefully raising it up on its rollers and over the top of the instrument to give access to the antifoam cartridge location.
3. Locate the red nut under the measurement column (No. 1 in the diagram), and unscrew it by turning it clockwise.



4. Remove and discard the old filter (No. 2 in the diagram) and replace it with a new one (No. 3 in the diagram). Screw the red nut back in position, finger tight.
5. The plastic front protection door can now be put back in place by lowering it down over the instrument, ensuring the rollers are correctly located inside the slots on each side.

CAUTION

Ensure the rollers are correctly positioned inside the slots before slowly and carefully lowering the door. Incorrect positioning and/or forcing the door down could easily damage the exterior housing of the instrument.

6. Manually raise the piercing device back to its upmost (home) position. Refer to [Home position on page 79](#) if you are unsure how to do this.

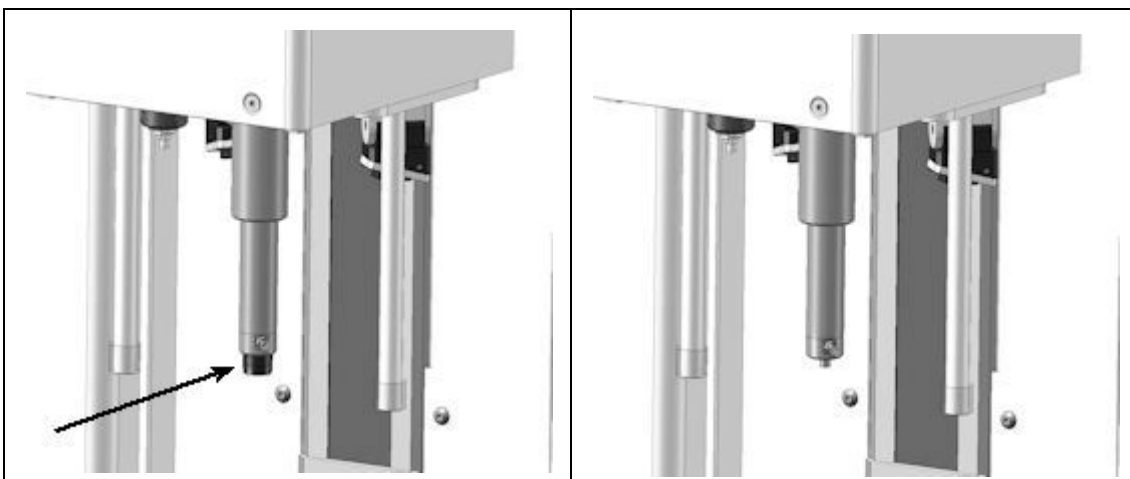
9.7 Replacing the piercing gasket and tip



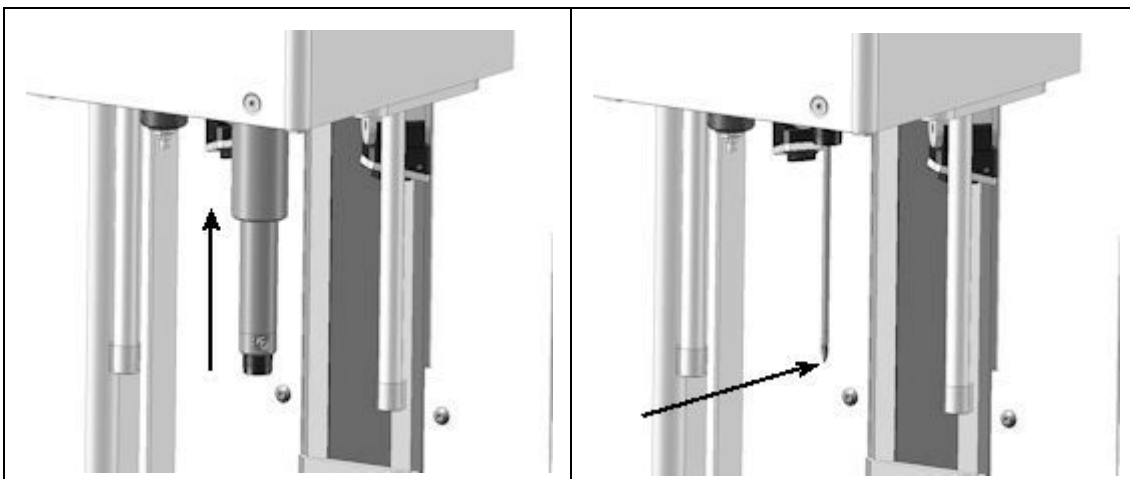
CAUTION

The piercing tip is very sharp. Take extreme care during this process.

1. Lower the piercing device to its lowest point (it will stop automatically once this point is reached). If using the wizard, simply press the **Do It** key on screen. If not using the wizard, refer to [Manual displacement on page 80](#) for details.
2. The illustration below left, shows the position of the black rubber gasket. Carefully twist and remove the gasket to reveal the piercing head (illustrated below right). Carefully clean the head with a damp tissue to remove all traces of grease and liquid residue.



3. Place a new gasket on the piercing head.
4. Shut off the forcing gas to allow easier manipulation of the needle assembly.
5. Next slide the piston up (illustrated below left) to reveal the needle assembly and piercing tip (illustrated below right).

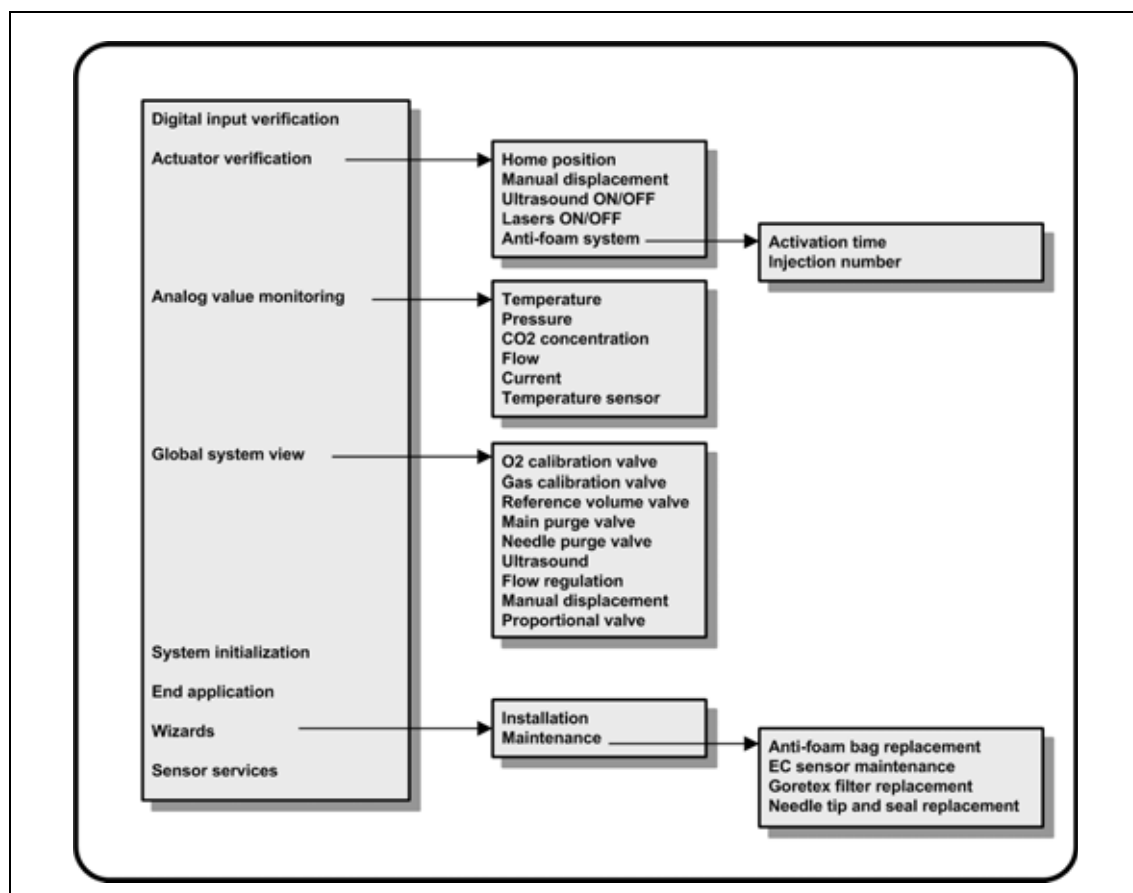


CAUTION

The piercing tip is very sharp. Do not push from underneath, but hold the piston from the side.

6. Unscrew the piercing tip at the bottom of the needle assembly and replace it with a new one. The new tip should be screwed in finger tight, then using a piece of tissue paper to protect the tip tighten with a pair of small pliers.
7. Slide the piston back down to hide the needle.
8. Turn the forcing gas back on and raise the piercing device back to its upmost (home) position. Refer to [Home position on page 79](#) if you are unsure how to do this.

9.8 Maintenance menu overview

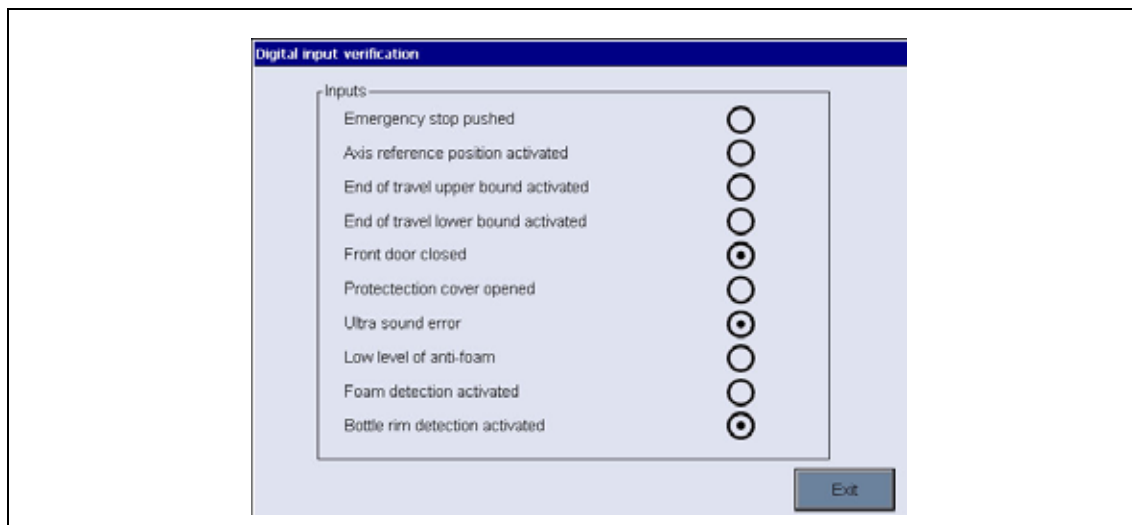


This section describes the maintenance options that are available directly from the instrument:

- Digital input verification
- Actuator verification
- Analog value monitoring
- Global system view
- System initialization
- End application
- Wizards
- Sensor services

9.8.1 Digital input verification

The goal of this menu is to check all devices that provide digital inputs to the instrument microprocessor. A black dot in the circle to the right of each option signifies that the specific sensor has been activated.



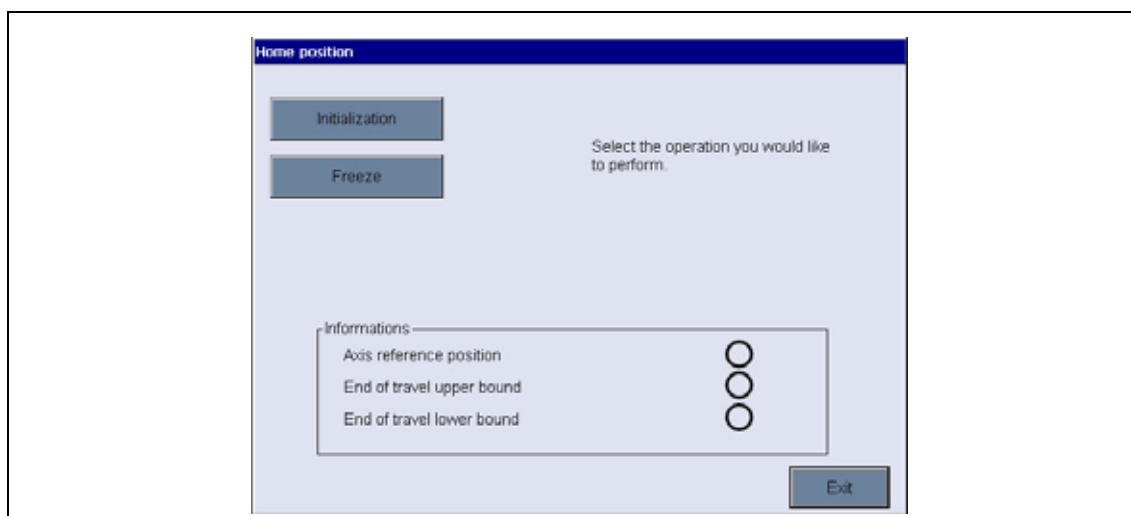
- **Emergency stop pushed:** Activated when the emergency stop button is pushed. The ultra sound option will also have a black dot as the power supply of the sonotrode is deactivated at the same time.
- **Axis reference position activated:** The black dot indicates that the piercing device is positioned in the reference (home) location.
- **End of travel upper bound activated:** The upper bound limit is located higher than the reference position. If this button is activated it means that the system is in an abnormal state of operation and you should call your local Hach Lange representative.
- **End of travel lower bound activated:** Activated when the piercing device is in its lowest position.
- **Front door closed:** Activated when the front door is closed.
- **Protection cover opened:** Activated when the top protection cover is not in place.
- **Ultra sound error:** Activated when the sonotrode is not working correctly.
- **Low level of antifoam:** Activated when the antifoam cartridge is nearly empty.
- **Foam detection activated:** Activated when foam or liquid has ingressed into the gas sampling tube.
- **Bottle rim detection activated:** Activated when a package is detected by the optical barrier. For control purposes, this can be activated by passing the hand between both optical detectors.

9.8.2 Actuator verification

This menu allows you to manually move the piercing device, and to effect a number of other controls. Select from:

- Home position
- Manual displacement
- Ultrasound ON/OFF
- Lasers ON/OFF
- Antifoam system

9.8.2.1 Home position

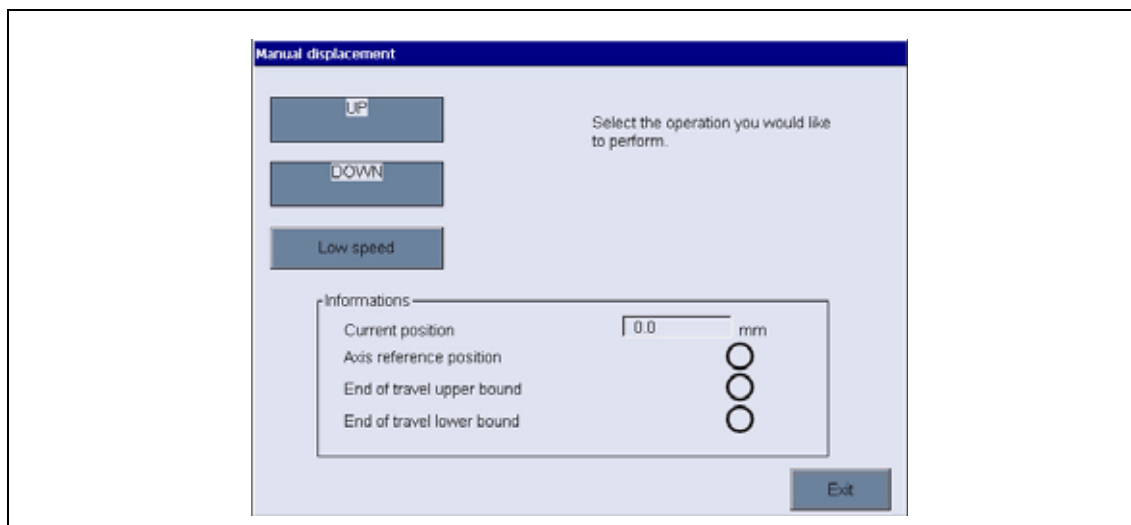


Select from:

- **Initialization** - to return the piercing device assembly back to its home (top) position. This can be useful if, for some reason, the piercing device has not returned its home position.
- **Freeze** - will stop the piercing device if the initialization button has been pressed.

9.8.2.2 Manual displacement

This option allows you to test the movement of the piercing assembly.



Select from:

- UP
- DOWN
- Speed

Press on the **UP** button to move the piercing assembly up, or on the **DOWN** button to move it down. The current position is displayed as the assembly moves up or down.

Note: The longer you press on the button, the further the piercing assembly will move in the requested direction. Pressing continuously on the UP button will take the assembly to its home (top) position, and pressing continuously on the DOWN button will take it to its lowest position.

It is advisable to check the process using the three different speed settings (low, medium and high) by toggling the speed with the **Speed** button.

9.8.2.3 Ultrasound ON/OFF

Switch between having the ultrasound system on or off.

Important Note: Before turning **ON**, remove any pierced packages from the package holder to avoid any liquid spillage.

With some water in the base of the package holder, test the system is working by moving your finger across the base of the package holder and toggling the switch between **ON** and **OFF**. You should sense a noticeable difference.

9.8.2.4 Laser ON/OFF

Switch between having the laser lights on or off.

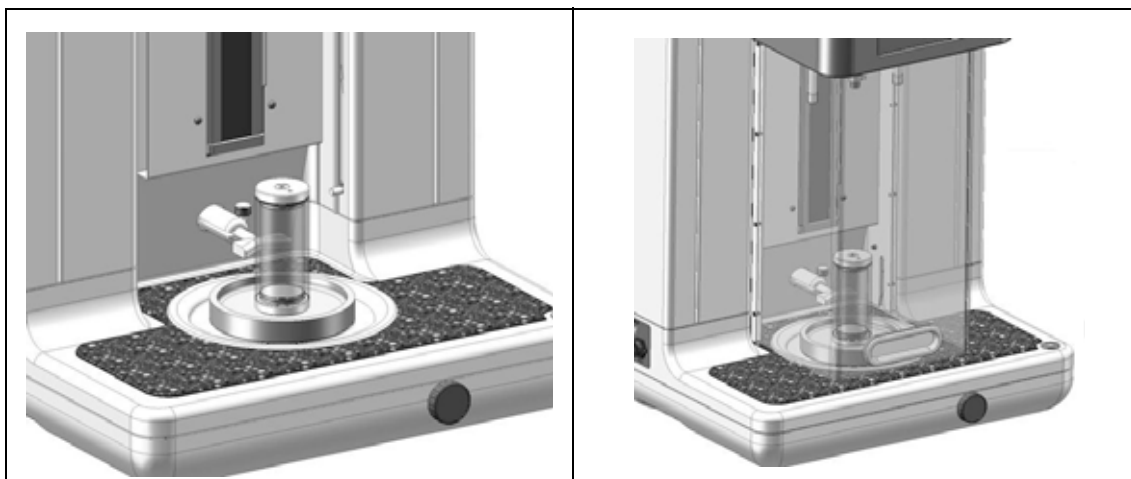
Test the system is working by toggling the switch to **ON** and you should see the two red laser beams intersecting on the package holder. Toggle the switch back to **OFF** and the laser beams should disappear.

9.8.2.5 Antifoam system

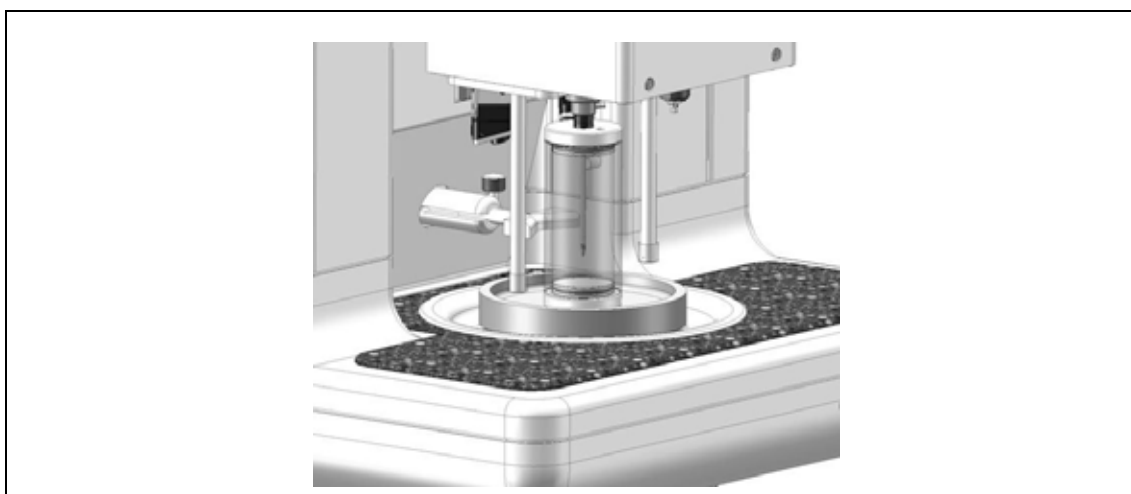
Use this option to test that the antifoam injector system is working, to purge the system before an extended stand-by (several weeks) or when performing start up procedures.

Follow these instructions:

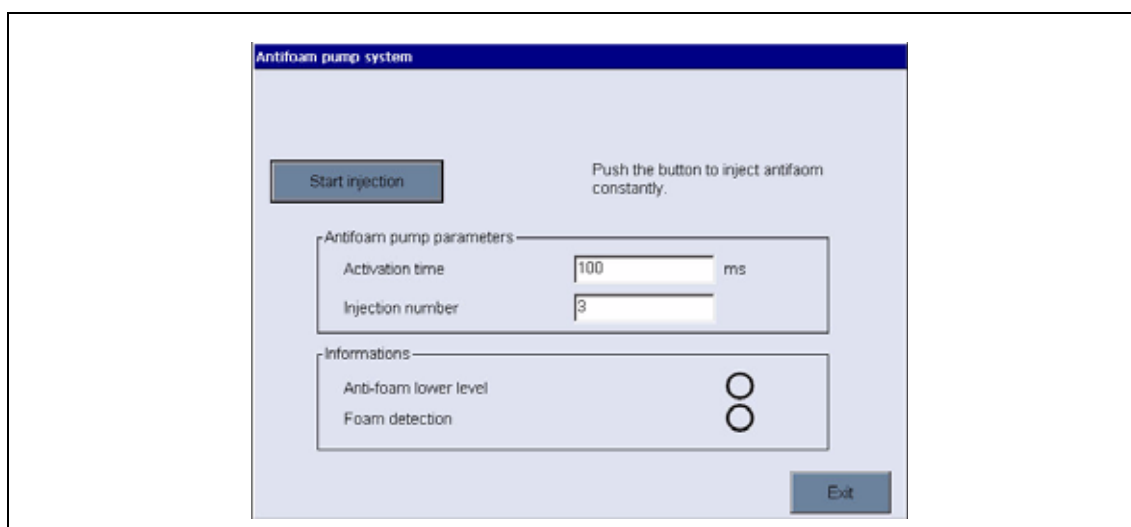
1. An antifoam priming tool is available from the spares kit delivered with the instrument. Place this on the ultrasonic base of the instrument, using the lasers to center it (illustrated below left) and lower the plastic front door (illustrated below right).



2. Activate the motor to lower the instrument head, allowing the needle to penetrate approximately to the center of the priming tool (illustrated below). Refer to [Manual displacement on page 80](#) for details on lowering the instrument head.



3. Select the **Antifoam system** option from the **Actuator verification** screen and enter:
 - Activation time: Enter the activation time in milliseconds.
 - Injection number: Enter the number of injections.

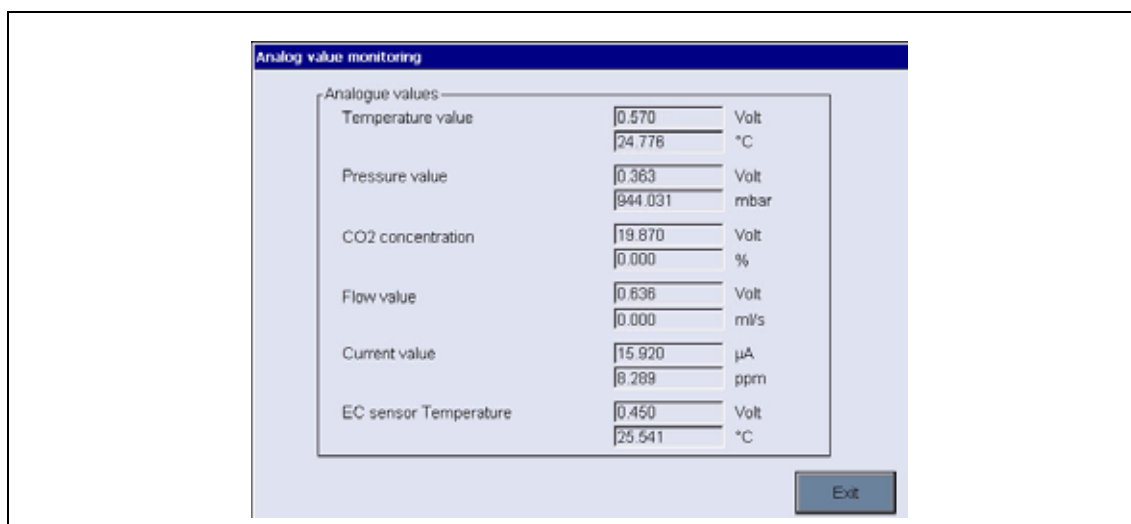


4. Press the **Start injection** button and you should hear the injector working. You should hear as many clicks as you have defined for the injection number. In addition, the liquid should be seen exiting from the tip of the needle.
5. On completion of the test, raise the instrument head to its home position. Remove the priming tool and rinse well with water. Store with the syringe and antifoam container for next usage.

9.8.3 Analog value monitoring

This screen shows all the main analog signals related to the main components of the instrument. Select this option to view the analog and actual values for:

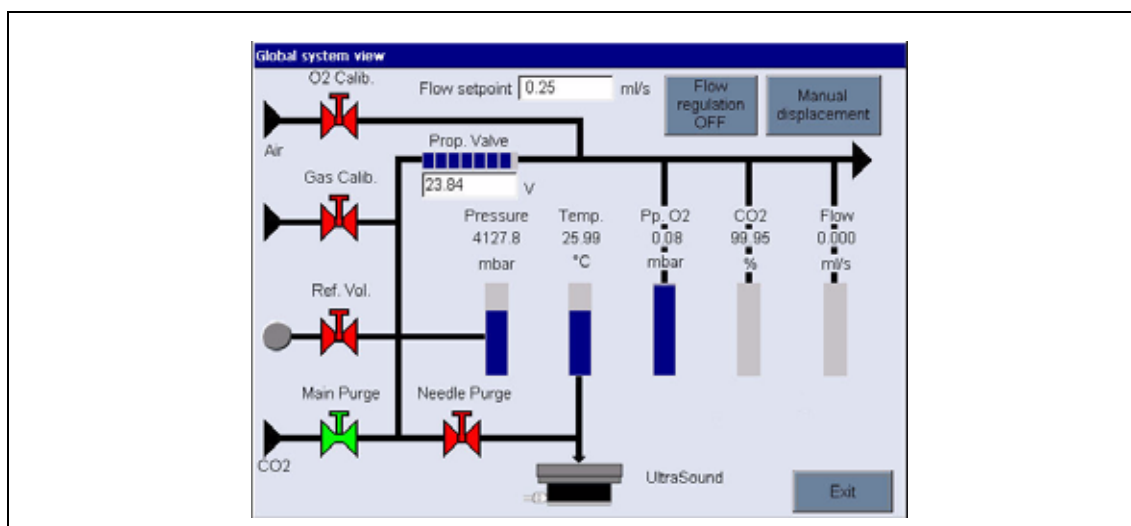
- Temperature
- Pressure
- CO₂ concentration
- Flow
- Current
- Temperature sensor



9.8.4 Global system view

This option allows you check various components of the instrument:

- O2 calibration valve
- Gas calibration valve
- Reference volume valve
- Main purge valve
- Needle purge valve
- On-off valves function
- Regulating valves function
- Ultrasound
- Flow regulation
- Manual displacement
- Proportional valve



Check a component by pressing on the button/schematic (which will turn to green) and observe the values being displayed.

Note: If the gas flow rate is manually changed, be aware that the automatic purge procedure (every 5 minutes) will reset the gas flow rate back to 0.25 mL/s, which will have an impact on the values being observed.

9.8.5 System initialization

Selecting this option initiates the standard system startup process, without having to power off and on the instrument. See [Instrument startup on page 29](#) for more information on system startup.

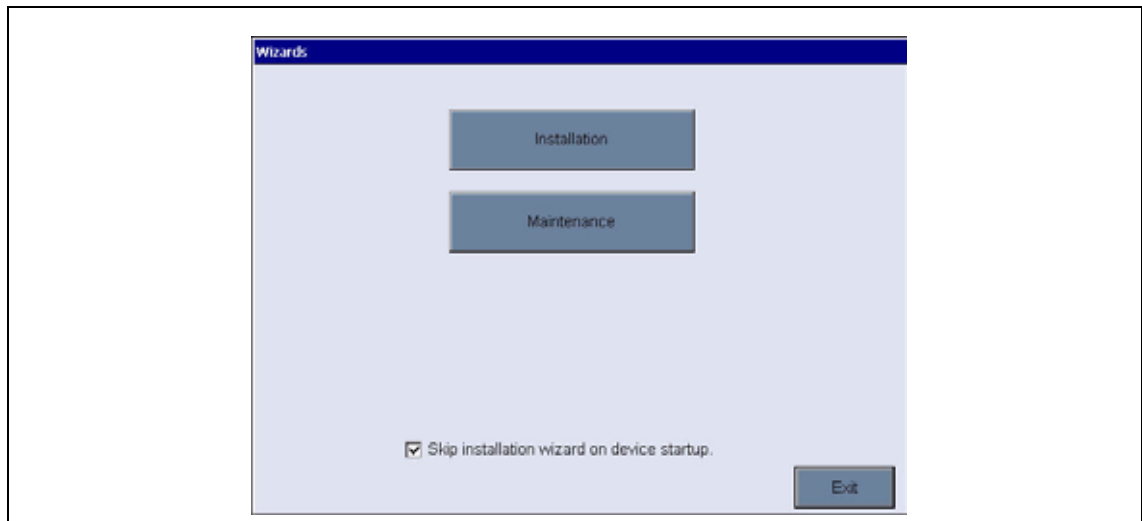
9.8.6 End application

Select this option to perform an orderly shut down of the instrument. On completion, the instrument can be powered **OFF**.

9.8.7 Wizards

This option gives a visual guide on a number of standard procedures to perform on the instrument. There are currently two groups of wizards available for:

- Installation
- Maintenance



The installation wizard will be invoked automatically the first time the instrument is switched on to help you complete the installation of the instrument. Once the instrument has been successfully installed, the **Skip installation wizard on device startup** checkbox should be checked to ensure a normal startup from there onwards.

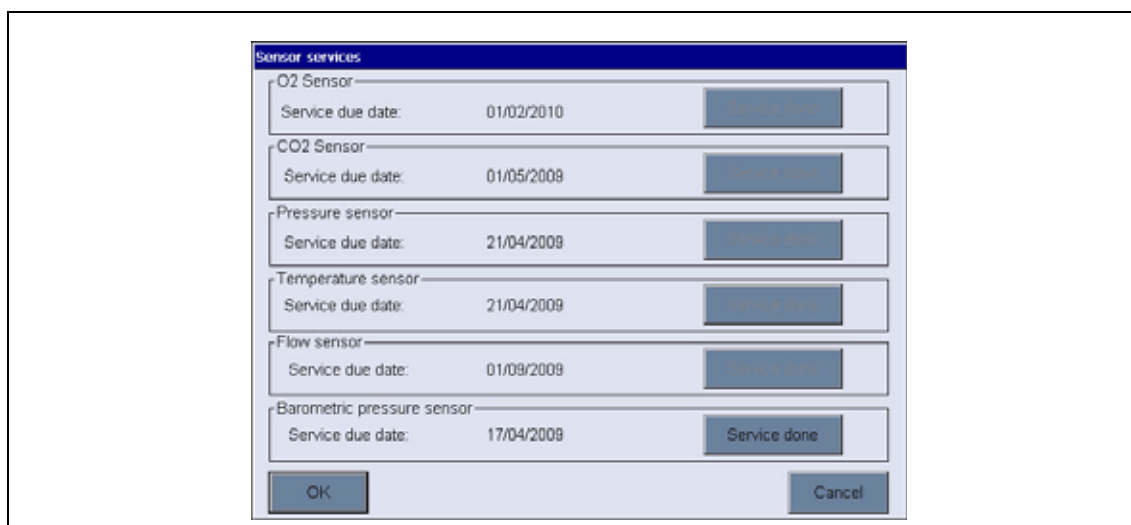
The maintenance wizard gives you four options:

- Antifoam bag replacement
- EC sensor maintenance
- Gore-Tex filter replacement
- Needle tip and seal replacement

These options are also described at the front of this section - see [Replacing the piercing gasket and tip on page 76](#), [Oxygen sensor maintenance on page 74](#), [Gore-Tex® filter replacement on page 75](#) and [Replacing the piercing gasket and tip on page 76](#) for more detailed explanations of these procedures.

9.8.8 Sensor services

This option lists the service due date for each sensor. These are user-defined in [Sensor configuration on page 50](#). As each service due date is passed, the **Service done** button will be made available (as with the Barometric pressure sensor in the example below).



Press the **Service done** button provided the service has been performed on the sensor. This will then reset the service due date based on how the sensor service has been configured.

Note: Pressing the Service done button may also have an effect on the colored LED indicator on the top right of the header banner. For example, if this showed yellow indicating a sensor service was required, then by letting the system know the service has been completed, the color will change to green provided it was the only sensor awaiting a service.

Observation	Explanation
Negative TPO results	CO ₂ purge gas is not of the required purity of > 99.5%
The instrument never reaches the threshold value	CO ₂ purge gas is not of the required purity of > 99.5%
The bottle goes up with the piercing head	Stop the analysis by pressing the emergency button and remove the bottle. Check that the piercing spike is in place and not unscrewed. Pull the emergency button to his initial position. and restart the instrument.
	Open the front door to stop the process. Remove the bottle and check that the piercing spike is in place and is not unscrewed. Close the front door and press the Abort button on the screen.

Section 10 Troubleshooting

10.1 Error and warning messages

Note: If any error or warning persists, please contact your Hach Lange representative for assistance.

10.1.1 Error messages

Error code	Displayed message	Probable cause	Solution
HEX001	E1: Emergency Stop.	Emergency stop button pushed.	Release emergency stop button. If necessary, initialize the motor.
HEX002	E2: Motor error.	The measuring head has missed an obstacle.	Initialize the motor.
		Emergency stop button pushed if the motor is moving.	
HEX004	E4: The front door has been opened. The measurement process has been stopped.	The front door has been opened before the end of the measurement process.	Close the front door.
		The front door is not closed properly.	Control the front door mechanism.
HEX010	E10: Foam has been detected in the gas path. The measurement process is canceled.	There is a problem with the antifoam injection.	Try another measurement.
		Incorrect tilt of the sonotrode.	Check the tilt of the sonotrode.
		There is no more antifoam.	Check the antifoam level and refill if necessary. Prime the anti-foam pump.
		The pressure in the package is greater than the purge gas pressure.	Increase the purge gas pressure.
HEX020	E20: Not enough pressure in the system. The measurement process is canceled.	Problem of flow regulation during the measurement.	Check the purge gas pressure. Change the Gore-Tex filter.
		The gas path is partially or totally blocked.	Control the antifoam injection.
HEX040	E40: Check gas supply, current pressure: xxxxx.	Before filling the reference volume, the pressure is lower than 1.5 bar.	Check the purge gas pressure.
HEX100	E100: Ultrasound error.	The ultrasound power supply is OFF.	Check the ultrasound power supply.
		The emergency stop button is not released.	Release emergency stop button.
		There is too much water in the ultrasound generator.	Remove any excess water.
HEX200	E200: Motor error - High limit.	The motor is above the reference position.	Go to the maintenance menu, move the motor down and initialize it.
		An upper or lower limit is ON.	

10.1.2 Warning messages

Warning code	Displayed message	Probable cause	Solution	Code in results file
HEX001	W1: Unstable reference pressure.	The variation of reference pressure is too high.	Check the pressure stability of the input reference gas.	1
HEX002	W2: Unmatched package size.	The measured package height is different from the value defined in the package definition.	Check the package size definition.	2
HEX004	W4: Measurement stopped. The needle pressure is too low.	The measurement pressure is lower than 3.5 bar.	Check the black seal on the piercing unit.	4
			Check the purge gas pressure.	
			Check the forcing gas pressure.	
		Gas path not airtight.	Check the airtightness of the gas path between the piercing unit and the measurement chamber.	
HEX008	W8: Headspace pressure not stable.	A leak has been detected between the cap and the seal.	Check the black seal on the piercing unit.	8
			Check the airtightness of the gas path between the piercing unit and the measurement chamber.	
			Check the forcing gas pressure.	
			Check the Gore-Tex filter.	
HEX020	W20: Measurement process incomplete. Insufficient initial package pressure.	The pressure in the package is too low to continue with a measurement.	N/A	20
HEX040	W40: Spontaneous degassing...	A spontaneous degassing is detected at the end of the first expansion.	N/A	40
HEX080	W80: Measurement process incomplete. Insufficient package pressure during ultrasound stage.	The measured pressure is too low to compute the second phase of the measurement.	Check foam intrusion in the gas path.	80
			Check Gore-Tex filter.	

10.1.3 Red LED's on startup screen

Item	Possible cause	Corrective action
Boards	Bad communication between boards. This may happen when switching the analyzer on.	Switch analyzer off, wait 10 seconds and switch back on. If the LED is still red contact your Hach Lange representative.
O ₂ sensor	No communication between sensor and board.	Check connection of the oxygen sensor.
O ₂ sensor residual too high	O ₂ concentration is not below residual threshold (0.1 mbar)	<p>Check gas purity and gas connections. Check sensor protection cap positioning. Wait until a residual < 0.1 mbar is reached. Monitor the sensor behavior in the Global System View screen (see Global system view on page 83). Perform a sensor maintenance (necessary for the initial start up).</p> <p>Note: A high residual value will also affect the TC sensor readings and may cause them to go out of bounds. The problem with the TC sensor readings will self-correct as the residual value returns to normal.</p>
TC sensor	No communication between sensor and board. Sensor damaged.	<p>Check sensor voltage on the analog value monitoring screen (see Analog value monitoring on page 82). Perform a calibration. Check validity of the calibration standard. Replace sensor if values are out of range.</p>
Temperature sensor	No communication between sensor and board. Sensor damaged.	<p>Check sensor voltage on the analog value monitoring screen (see Analog value monitoring on page 82). Perform a calibration. Check validity of the calibration standard. Replace sensor if values are out of range.</p>
Flow sensor	No communication between sensor and board. Sensor damaged.	<p>Check sensor voltage on the analog value monitoring screen (see Analog value monitoring on page 82). Perform a calibration. Check validity of the calibration standard. Replace sensor if values are out of range.</p>
Pressure sensor	No communication between sensor and board. Sensor damaged.	<p>Check sensor voltage on the analog value monitoring screen (see Analog value monitoring on page 82). Perform a calibration. Check validity of the calibration standard. Replace sensor if values are out of range.</p>
Anti foam level	Cartridge empty. Level connectors not connected or badly connected.	<p>Check that both connectors on the bottom of the cartridge are firmly in place. Refill the cartridge if empty.</p>
Foam detector	Ingress of foam or liquid in the sampling tube.	Activate needle purge in the Global System View screen (see Global system view on page 83).
Electrovalves		Check device function in the Digital Input Verification screen (see Digital input verification on page 78).
Motor	Bad initialization or communication.	Initialize motor position in the Actuator Verification screen (see Actuator verification on page 79).
Ultrasound	Sonotrode failure	Check device function in the Global System View screen (see Global system view on page 83).

Protection Cover	Cover is not on the analyzer or is badly positioned. Cover detection sensor failure.	Check that the cover is correctly in place and fixed with screws. Check that the position detector is in place (in the back of the analyzer).
Emergency stop	The emergency stop button is in the activated position (pushed in).	This can happen during transportation. Release the button to its normal position by turning it clockwise.

10.1.4 Measurement problems

Observation	Explanation
Negative TPO results	CO ₂ purge gas is not of the required purity of > 99.5%
The instrument never reaches the threshold value	CO ₂ purge gas is not of the required purity of > 99.5%
The bottle goes up with the piercing head	Stop the analysis by pressing the emergency button and remove the bottle. Check that the piercing spike is in place and not unscrewed. Pull the emergency button to his initial position. and restart the instrument.
	Open the front door to stop the process. Remove the bottle and check that the piercing spike is in place and is not unscrewed. Close the front door and press the Abort button on the screen.

Section 11 Spare Parts and Accessories

Part N°	Description
32912	O2 flow chamber O-ring kit for 6110
33001	Power Cord - EU Plug
33002	Power Cord - US Plug
33003	Power Cord - Swiss Plug
33004	Power Cord - UK Plug
33117	Seal to package for 6110
33124	Filter, Gore-Tex membrane for 6110
33141	Rubber feet for 6110
33142	Sonotrode seal for 6110
33143	Staron bottom plate for 6110
33144	Protection shield for 6110
33153	Door detector with cable for 6110
33154	Kit pneumatic tubing for 6110
33156	Antifoam recharge bottle for 6110
33157	Antifoam cartridge (empty) for 6110
33160	Cover detector with cable for 6110
33161	Antifoam Priming Vessel
33162	Syringe for Antifoam cartridge
29140J	Power Cord - Japanese Plug
6110-AD	Total O2/CO2 package analyzer
DG6110-MAN/D	6110 Manual in German
DG6110-MAN/E	6110 Manual in English
DG6110-MAN/F	6110 Manual in French
DG6110-MAN/J	6110 Manual in Japanese
DG6110-SYS	Total O2/CO2 package analyzer
DGA1100-MAN/D	A1100 Manual in German
DGA1100-MAN/E	A1100 Manual in English
DGA1100-MAN/F	A1100 Manual in French
DGA1100-MAN/J	A1100 Manual in Japanese

Section 12 Material Safety Data Sheets (MSDS)

12.1 Silicon antifoam (part number 33156)

PRODUCT AND COMPANY IDENTIFICATION			
PRODUCT NAME		Silicon antifoam, emulsion, 30% in water	
COMPANY		Hach Lange SA 6 Route de Compois Case Postale 212 CH-1222 Vésenaz, Switzerland	
PHONE NO.		0041 22 594 64 00	
COMPOSITION / INFORMATION ABOUT THE COMPONENTS			
INGREDIENT	CAS NO	PERCENT	HAZARDOUS
Silicone antifoam emulsion	N/A	70%	No
Water	7732-18-5	30%	No
IDENTIFICATION OF HAZARDS			
OVERVIEW	SPECIAL INDICATION OF HAZARDS TO HUMANS AND THE ENVIRONMENT Not hazardous according to Directive 67/548/EEC.		
FIRST AID			
INHALATION		If inhaled, remove to fresh air. If breathing becomes difficult, call a physician.	
INGESTION		If swallowed, wash out mouth with water provided person is conscious. Call a physician.	
SKIN CONTACT		In case of contact, immediately wash skin with soap and copious amounts of water.	
EYE CONTACT		In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. Call a physician.	
FIRE FIGHTING MEASURES			
FIRE EXTINGUISHING MEDIA		Suitable: Water spray. Carbon dioxide, dry chemical powder, or appropriate foam.	
SPECIAL INFORMATION		Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.	
MEASURES IN CASE OF SPILLAGE			
Wash spill site with soap solution. Flush spill area with copious amounts of water. Absorb on sand or vermiculite and place in closed containers for disposal.			
HANDLING AND STORAGE			
Directions for Safe Handling: Avoid inhalation. Avoid contact with eyes, skin, and clothing. Avoid prolonged or repeated exposure. Conditions of Storage: Keep tightly closed.			
EXPOSURE CONTROLS / INDIVIDUAL PROTECTION			
ENGINEERING CONTROLS		Safety shower and eye bath. Mechanical exhaust required.	
GENERAL HYGIENE MEASURES		Wash thoroughly after handling.	
PERSONAL PROTECTIVE EQUIPMENT		Eye Protection: Chemical safety goggles.	

PHYSICAL AND CHEMICAL PROPERTIES			
APPEARANCE	Color: White.	Form: Turbid viscous liquid	
	Property	Value	At temperature or pressure
	pH	6.5 - 7.5	760 mmHg
	BP/BP range	100 °C	
	MP/MP range	- 1.0 °C	
	Flash point	N/A	
	Flammability	N/A	
	Autoignition temp	N/A	
	Oxidizing properties	N/A	
	Explosive properties	N/A	
	Explosion limits	N/A	
	Vapor pressure	N/A	
	SG/density	0.999 g/cm ³	
	Partition coefficient	N/A	
	Viscosity	N/A	
	Vapor density	N/A	
	Saturated vapor conc.	N/A	
	Evaporation rate	N/A	
	Bulk density	N/A	
	Decomposition temp.	N/A	
	Solvent content	N/A	
	Water content	N/A	
	Surface tension	N/A	
	Conductivity	N/A	
	Miscellaneous data	N/A	
Solubility	N/A		
STABILITY AND REACTIVITY			
STABILITY		Stable	
HAZARDOUS EXOTHERMIC REACTIONS		Will not occur	
HAZARDOUS POLYMERIZATION		Will not occur.	
MATERIALS TO AVOID		Strong oxidizing agents.	
TOXICOLOGICAL INFORMATION			
ACUTE TOXICITY		LD50 Oral Rat > 5,000 mg/kg	
		LD50 Skin Rat > 2,000 mg/kg	
SENSITIZATION		Sensitization: Will not occur	
SIGNS AND SYMPTOMS OF EXPOSURE		To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.	
ROUTE OF EXPOSURE	Skin Contact	May cause skin irritation.	
	Skin Absorption	May be harmful if absorbed through the skin.	
	Eye Contact	May cause eye irritation.	
	Inhalation	Material may be irritating to mucous membranes and upper respiratory tract. May be harmful if inhaled.	
	Ingestion	May be harmful if swallowed.	

ECOLOGICAL INFORMATION			
Test Type: LC0 Fish	Species: Brachydanio rerio	Time: 96 h	Value: 180 mg/l
Test Type: LC50 Fish	Species: Brachydanio rerio	Time: 96 h	Value: 250 mg/l
Test Type: LC100 Fish	Species: Brachydanio rerio	Time: 96 h	Value: 350 mg/l
DISPOSAL CONSIDERATIONS			
Incinerate in a furnace providing environmental regulations permit. Observe all federal, state, and local environmental regulations.			
TRANSPORT INFORMATION			
RID/ADR		Non-hazardous for road transport.	
IMDG		Non-hazardous for sea transport.	
IATA		Non-hazardous for air transport.	
REGULATORY INFORMATION			
Not hazardous according to Directive 67/548/EEC. Caution: Substance not yet fully tested (EU).			
COUNTRY SPECIFIC INFORMATION		Germany	WGK: 1 Self-Classification
OTHER INFORMATION			
WARRANTY	The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product.		
PRODUCT USE	For laboratory use only. Not for drug, household or other uses.		
The information in this sheet is believed to be correct at the time of printing. The details should be reviewed periodically and should be checked for special uses.			

